



AGRICULTURAL RESEARCH INSTITUTE
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Concordia tolli tibi Plume Ievi.

THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

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1863, NEWCASTLE. 1864, BATH. 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER. 1870, LIVERPOOL. 1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL. 1876, GLASGOW. 1877, PLYMOUTH.

1878, DUBLIN. 1879, SHEFFIELD. 1880, SWANSEA. 1881, YORK.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

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THE YEAR-BOOK OF PHARMACY AND TRANSACTIONS.

The Conference annually presents to members a handsome octavo volume of 500 or 600 pages, containing the proceedings at the yearly meeting, and a report on the progress of pharmacy, on a Year-Book, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home or abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for chemists, druggists, and others interested in pharmacy. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, pupils, assistants, or pupils—and obtain as large a number of new members as possible. Alphabetical lists of (1) the names and addresses of subscribers, and (2) of the towns in which they reside, will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to any officer or member. The Name and Address of each candidate to be written legibly, and forwarded by letter addressed as follows:—*The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C.* The subscription may be sent at the same time.

THE ANNUAL SUBSCRIPTION.

The Conference Year commences on July 1st, and Annual Subscriptions are due in advance on that date. For Great Britain and Ireland, and for all countries included in Schedule "A" of the Postal Union, the Subscription is Seven Shillings and Sixpence. For other countries the Subscription is Seven Shillings and Sixpence, and in addition the cost of the postage to those countries of a book weighing two imperial pounds.

Remittances may be made by Post Office Order, crossed " & Co.," made payable to the British Pharmaceutical Conference, at the "High Holborn" Post Office, and should be addressed as follows:—*The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C.*

To all members who have previously paid the annual subscription, the Year-Book, including Transactions, is posted as soon as published in December, and to other members immediately on receipt of the Subscription.

Extra copies of the Year-Book and Transactions for 1873, and subsequent issues, will be sent to members, on receipt of a subscription as above, for each additional copy. To non-members the price is Ten Shillings per volume, exclusive of postage. Volumes previous to 1873 are out of print.

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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1879, TO JUNE 30,

1880.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

SEVENTEENTH ANNUAL MEETING

HELD IN

SWANSEA,

AUGUST. 1880

LONDON:

J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.

MDCCCLXXX.

YEAR-BOOK OF PHARMACY AND TRANSACTIONS

OF THE

British Pharmaceutical Conference.

1879-80.

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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1881 will be held at York, on Tuesday and Wednesday, August 30th and 31st.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from

THE SECRETARY; BRIT. PHARM. CONF.,
17, Bloomsbury Square, London, W.C.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 357.

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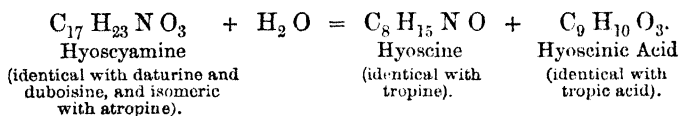
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INTRODUCTION.

THE reader will see from a perusal of this volume that the literature of pharmacy and its allied sciences has again received numerous and valuable contributions. Among the items to be passed in brief review in this introductory chapter, we desire to give the first and most prominent place to the masterly work done by Professor Ladenburg in connection with the alkaloids atropine, hyoscyamine, daturine, and duboisine. It would be difficult, indeed, to point to another instance—search as we may through the scientific literature of the year—in which success has been more perfectly commensurate with able and persevering efforts, and in which link after link has been added to the chain of information with equal precision.

The reaction of atropine with barium hydrate, resulting—as MM. Kraut and Lossen have shown—in the formation of tropine, $C_8H_{15}NO$, and tropic acid, $C_9H_{10}O_3$, forms the basis of Prof. Ladenburg's experiments. From him we learn that tropine tropate, as obtained in this decomposition, may be reconverted into atropine by treatment with dilute hydrochloric acid, and that the atropine thus artificially prepared is identical in every sense with the natural alkaloid. By extending the same treatment to other tropine salts, a number of bases analogous to atropine can be produced, for which as a class he proposes the name of *tropelines*, salicyl-tropine, oxytoluyl-tropine, and phthalyl-tropine being described in his report as instances of this kind. Tropicidine, another artificial base, obtained by the action of strong hydrochloric acid upon a mixture of tropine and glacial acetic acid, and answering to the formula $C_8H_{13}N$, is remarkable for the peculiar relation in which it appears to stand to collidine, $C_8H_{11}N$, and conine, $C_8H_{15}N$, occupying, as its formula shows, an intermediate position between the two. With increasing interest the reader will turn to the reports on hyoscyamine, daturine, and duboisine. In these it is shown that hyoscyamine, when treated with barium hydrate, yields hyoscyne and hyoscyneic acid, bodies so closely agreeing with tropine and tropic acid—the corresponding decomposition products of atropine,—that it is difficult to resist the conviction of their identity. In view of this identity (subse-

quently proved by further experiments), and of the fact that hyoscyamine and atropine have exactly the same chemical composition, both being represented by the formula $C_{17}H_{23}NO_3$, Prof. Ladenburg accounts for the difference existing between the two bases by assuming that their components are differently united, so that their isomerism may be comparable to that existing between gaultherin oil and salicylate of methyl. Daturine, which but a short time ago was proved to be distinct from atropine (*Year-Book of Pharmacy*, 1878, p. 24), is now again deprived of its individuality, for its composition, its characters, its behaviour towards reagents, and the composition and properties of its auro-chloride, all point to its identity with hyoscyamine; and precisely the same is the case with duboisine, the alkaloid lately isolated by Mr. Gerrard from *Duboisia Myoporoides*. Whichever of these bases be acted upon with barium hydrate, the result is the same as with atropine, the reaction in each case occurring in accordance with the following equation:—



Close upon the recognition of the identity between hyoscyne and tropine, and between hyoscinic acid and tropic acid, follows, as might be expected, the actual conversion of hyoscyamine into atropine, and thus completes the success of this remarkable series of investigations.

It will be observed that throughout his reports Prof. Ladenburg speaks of atropine as of an alkaloid distinct from daturine, hyoscyamine, or duboisine, however closely related to them it may appear. In opposition to this view, Dr. E. Schmidt reasserts the identity of daturine and atropine so recently disputed by M. Poehl, and bases his assertion upon the results of a careful comparison of the chemical and physical properties of the two bases and of some of their combinations and decomposition products. Should this be confirmed, the number of mydriatic alkaloids known to occur in nature, already reduced to two by Prof. Ladenburg's researches, will dwindle down to a solitary one.

M. Tanret has continued his investigation of the root-bark of *Punica Granatum*, and describes four distinct alkaloids contained therein, viz., *methylpelletierine*, $C_{19}H_{17}NO$, a dextro-rotatory liquid; *pseudopelletierine*, $C_9H_{15}NO$, a crystalline solid; *pelletierine*, $C_8H_{15}NO$, a lævo-rotatory liquid; and *isopelletierine*, a liquid without action on polarized light, and isomeric with pelletierine.

Mr. D. B. Dott furnishes some interesting information respecting

the meconates of morphine, bodies which had hitherto received very little attention. From his experiments it appears that dimorphine meconate, $(C_{17}H_{19}NO_3)_2C_7H_4O_7, 5H_2O$, is the only stable crystalline combination between morphine and meconic acid, and that tri-morphine meconate does not exist, as every attempt to produce it from the corresponding proportions of base and acid resulted in the formation of di-morphine meconate and the separation of uncombined morphine. By dissolving the base and acid in the proportion of equal molecular weights, he obtained indications of the existence of an amorphous mono-morphine meconate, which, however, is so unstable, that mere contact with water or alcohol suffices to split it up into the dibasic salt and free meconic acid. These results also tend to show that, contrary to the general assumption, meconic acid is not tribasic, but probably dibasic, a conclusion which agrees with the view expressed on the point by Messrs. Dittmar and Dewar in 1867. M. Polstorff has studied the oxidation of morphine by potassium ferricyanide, and describes a crystalline base of the formula $C_{34}H_{36}N_2O_6$, named by him *oxydimorphine*, as the product of this reaction. It forms well defined crystallizable salts with sulphuric and hydrochloric acids, and proves to be identical with the so-called oxymorphine obtained by the action of potassium permanganate on morphine in the presence of alkaline carbonates. Prof. Prescott criticises some of the methods used for the determination of morphine in opium, and gives the details of an improved process, based in the main on those of Jacobsen and Hager, but differing from these chiefly in the preliminary treatment of the opium with benzol, to remove the wax and other impurities which otherwise interfere so much with the filtration of the aqueous extracts. For the morphimetric valuation of tincture of opium he recommends certain modifications in the processes of Hager and Staples, both of which he finds to give trustworthy results. Among other methods of opium assay published during the year, we may mention one by Dr. E. Mylius, which is a modification of the well-known process proposed by Prof. Flückiger. We conclude our notice of the opium bases by alluding to a new test for papaverine and codeine introduced by Mr. S. Tattersall, consisting in the heating of the sulphuric acid solution of the alkaloid with sodium arseniate, which thus produces a deep bluish violet coloration, changing to black on the subsequent addition of sodium hydrate.

The contributions to the literature of cinchona alkaloids deal for the most part with the oxidation products of these bases. The observation that quinine, cinchonine, and cinchonidine yield upon

oxidation formic acid, together with a substance possessing the properties of an alcohol or phenol, induces M. Skraup to assume the presence of a methoxyl group in these bodies. In conjunction with M. Vortmann, he confirms the formula $C_{19}H_{23}N_2O$ as the correct one for pure cinchonine and cinchonidine, and describes a base named cinchotenidine, $C_{18}H_{20}N_2O_3$, which is obtained among the products of the oxidation with permanganate under the same conditions under which cinchonine yields cinchotinine. MM. Hoogewerff and van Dorp correct an error in their previous statements respecting the ratio between the permanganate and quinine sulphate used in their experiments, and report that instead of a mixture of pyridine-carbonic acids being formed, as previously stated by them, only pyridinetricarbonic acid is obtained in this reaction. MM. Weidel and Schmidt find that quinine when oxidized by fuming nitric acid yields only cinchomeronic acid, while cinchonine and cinchonidine, treated in the same manner, furnish cinchoninic, chinolic, cinchomeronic, and oxycinchomeronic acids. The results of a study of some derivatives of cinchonine lead M. Wisnegradsky to the conclusion that this alkaloid contains a methylchinoline and an ethylpyridine nucleus. By the addition of hydrogen, the double union of carbon and nitrogen in the two nuclei may be supposed to be loosened, and from the hypothetical secondary bases thus formed, cinchonine may be constituted by the intervention of the acid radical $CH_3 \cdot CH \cdot CO$ or $CH_2 \cdot CH_2 \cdot CO$. If this view of the constitution of cinchonine prove correct, its synthetical production ought before long to be accomplished. Experiments by M. Oudemans on the action of quinamine on polarized light show that the maximum rotatory power of this base is obtained when one molecule of a monobasic, or half a molecule of a bibasic, acid is added to each molecule of alkaloid; and from this observation he concludes that quinamine is monacid. M. Yvon gives directions for the preparation of a basic and a neutral salicylate of quinine; while Mr. K.F. Mandelin shows the existence of three different citrates of the same base, answering respectively to the formulæ $Qu_3 \cdot 2 Ci$, $Qu Ci$, and $Qu_2 Ci$.

Mr. Dott's success in preparing a pure crystallized hydrochlorate of beberine, and his examination of this salt and of the platinum-chloride produced by it, have enabled him to prove that $C_{18}H_{21}NO_3$ is the formula correctly representing the composition of this alkaloid. The formula of its hydrochloride is $C_{18}H_{21}NO_3 \cdot HCl \cdot H_2O$, and that of the platinumchloride $(C_{18}H_{21}NO_3 \cdot HCl)_2 Pt Cl_4$.

M. Laiblin describes a process for the preparation of pure nicotine in large quantities, and then proceeds to the examination of nicotinic

acid, $C_6H_5NO_2$, the product obtained by oxidation with permanganate, which, like Huber, he regards as carbopyridenic acid. It forms crystalline compounds with hydrochloric and hydrobromic acids of the formulæ $C_6H_5NO_2 \cdot HCl$, and $C_6H_5NO_2 \cdot HBr$. A research on nicotine by MM. Cahours and Etard deals with a peculiar derivative of the formula $(C_{10}H_9O_2)_2S$, obtained by heating the alkaloid with sulphur. Tobacco smoke, according to MM. Le Bon and Noel, contains, besides hydrocyanic acid and various aromatic principles, an alkaloid probably identical with collidine, and as poisonous as nicotine. Prof. Selmi reports the isolation from the putrid human corpse of a poisonous alkaloid differing in its reaction from any known base.

The solution of the double iodide of bismuth and potassium for use as a reagent for alkaloids may be very conveniently prepared, as Mr. Thresh shows, by mixing the officinal liquor bismuthi with potassium iodide and hydrochloric acid in suitable proportions. The same author has experimented with a similar solution for quantitative purposes, and thinks that it may prove very serviceable in some cases as a volumetric test. M. Loesch criticises the principal processes in use for the determination of alkaloids in plants, and describes a method of his own which has given him the most satisfactory results. The proximate analysis of plants forms the subject of an elaborate report by Mr. H. B. Parsons, which is sufficiently complete to serve as a guide to those less experienced in these complicated investigations.

Glycyrrhizin, the glucoside of liquorice, has engaged the attention of M. Sestini and of M. Habermann. The former believes it to exist in the root in combination with bases, chiefly with lime, and not with ammonia as stated by Roussin (see *Year-Book of Pharmacy*, 1876, p. 93). The fresh root yields about three, and the dried root about six per cent. of glucoside. Pure glycyrrhizin, prepared by M. Habermann from the ammoniacal glycyrrhizin of commerce by repeated recrystallization from boiling glacial acetic acid and strong alcohol, then converting the pure acid ammonium glycyrrhizate into the lead salt, and decomposing this by sulphuretted hydrogen, proves to have a composition corresponding to the formula $C_{44}H_{63}NO_{18}$, or $H_3C_{44}H_{60}NO_{18}$, the latter formula showing it to be a tribasic acid. Its neutral potassium salt answers to the formula $K_3C_{44}H_{60}NO_{18}$, and the acid salt to $KH_2C_{44}H_{60}NO_{18}$; and both, as also the corresponding ammonium salts, are intensely sweet.

Among the essential oils investigated during the year may be

mentioned those of marjoram, lavender, spike, and rosemary, all of which are reported upon by M. Bruylants. The first named of the four is found by him to consist of a mixture of dextro-rotatory camphor and borneol, with 10 per cent. of resin and 5 per cent. of a dextro-rotatory hydrocarbon. The oils of lavender and spike likewise contain a mixture of borneol and camphor, and 10 per cent. of resin, together with 25 per cent. of terpene in the former and 35 per cent. in the latter. The oil of rosemary proves to contain 80 per cent. of a lævogyrate terpene with 6 to 8 per cent. of camphor, $C_{10}H_{16}O$, and about 5 per cent. of a borneol camphor, $C_{10}H_{18}O$. In a preliminary notice on oil of wine, M. Hartwig states that he has succeeded in separating this oil into numerous compounds, one of which is a ketone of the empirical formula $C_8H_{16}O$.

A research on pyroxylin by Mr. J. M. Eder presents the chemistry of this substance in a new light. According to the conclusions arrived at by this author, the different preparations comprised under this name are not nitro-compounds, but derivatives of nitric acid, containing the group NO_3 , and answering to the general formula $C_{12}H_{20-n}O_{10-n}(NO_3)_n$. *Gun-cotton*, properly so-called, is represented by him as cellulose hexanitrate, $C_{12}H_{14}O_4(NO_3)_6$, a very explosive compound insoluble in a mixture of ether and alcohol; while the pentanitrate, $C_{12}H_{15}O_5(NO_3)_5$, tetranitrate, $C_{12}H_{16}O_6(NO_3)_4$, trinitrate, $C_{12}H_{17}O_7(NO_3)_3$, and dinitrate, $C_{12}H_{18}O_8(NO_3)_2$, all of which are soluble in that mixture, are regarded as constituting *collodion cotton*.

The acid product of the action of nitric acid on berberine is found by Mr. H. Weidel to be not oxalic acid, as some have alleged, but *berberonic acid*, a crystalline body corresponding to the formula $C_8H_5NO_6 + 2H_2O$, and probably identical with pyridene-tricarboxylic acid.

Mr. W. F. Horn describes a new process for the preparation of phosphoric acid, the main features of which are the agitation of the phosphorus under water with a minute proportion of iodine, and its subsequent oxidation by nitric acid without the application of heat. The theory of this process is based on the observations of Dr. Brodie that iodine converts the vitreous phosphorus into the amorphous variety, which is readily oxidized by nitric acid. A very handy method of preparing pure hydriodic acid is suggested by Dr. C. Winckler, and consists in the passing of sulphuretted hydrogen in slight excess through a solution of iodine in carbon bisulphide previously covered with a stratum of water. The reaction results in the liberation of sulphur and the formation

of hydriodic acid, the former of which dissolves in the carbon bisulphide, while the latter forms a solution in the supernatant water, which is then decanted and freed from sulphuretted hydrogen by boiling.

Dr. R. Schneider shows that bismuth salts perfectly free from arsenic can be readily prepared from commercial bismuth without any previous purification of the metal. For this purpose it is only necessary to add the bismuth in successive portions to hot instead of cold nitric acid, and to continue the application of heat until the metal is dissolved. The whole of the arsenic present is thus precipitated as bismuth arsenate, a compound difficultly soluble in nitric acid and quite insoluble in the solution of bismuth nitrate, and is therefore completely eliminated by filtering the undiluted solution through asbestos. If cold nitric acid is used at the commencement of the operation, the arsenic is converted into bismuth arsenite, which remains dissolved in the acid liquid.

Analytical chemistry has again yielded numerous additions to scientific literature, and among them not a few which, owing to their interest to pharmacists, have found a place in this volume. Mr. R. H. Parker calls attention to the action of potassium chlorate on ferrous iodide, showing that these substances cannot be kept together in solution without undergoing such changes as to render them wholly incompatible as medicines. The solution at first is almost clear, but soon begins to assume a reddish brown colour and a distinct odour of iodine. The liberation of iodine continues to increase steadily, and is accompanied by the formation of potassium chloride and the gradual precipitation of the iron as hydrated ferric oxide. As a sequel to the study of this reaction, Mr. Parker describes a quantitative process for the estimation of the constituents of syrup of iodide of iron. M. Allary suggests a decided improvement in iodometric titrations in recommending the application of a standard solution of bromide and bromate of sodium containing one molecular weight of the latter to five of the former, which has the advantage of remaining unchanged on keeping. Such a solution is readily prepared by saturating a solution of sodium hydrate with bromine, evaporating the mixture to dryness, and dissolving the residue in water. It is standardized by adding it to a titrated solution of potassium iodide in the presence of hydrochloric acid and mucilage of starch until the colour of the mixture has changed from blue through red and cinnamon-brown to pale yellow. A new method for the detection and estimation of chlorides in the presence of iodides and bromides, proposed by Mr. G. Vortmann, is based

on the different behaviour of these salts to lead peroxide or manganese dioxide in the presence of acetic acid. The reducing action of hydriodic acid on arsenic acid, resulting in the formation of arsenious acid, water, and free iodine, forms the basis of a process, described by Mr. W. A. H. Naylor, for the detection and estimation of arsenic in the presence of arsenious acid. For the determination of arsenic in forensic analyses, MM. Millot and Magneune treat the organic substances under examination with nitric acid, evaporate the filtered liquid to dryness, take up the residue with dilute sulphuric acid, then introduce this solution into Marsh's apparatus, pass the gas through nitric acid to oxidize the arseniuretted hydrogen, and finally estimate the arsenic acid thus formed by titration with uranium acetate, using potassium ferrocyanide as an indicator. In connection with this method, however, we take leave to point out that, as the conversion of arsenic into arseniuretted hydrogen in Marsh's test is never complete, the results must necessarily be too low. The precipitation of arsenic by means of sulphuretted hydrogen, a process so often adopted in chemico-legal investigations, involves the risk of a serious error arising, as Dr. J. Otto and others have shown, from the presence of arsenic in the sulphuretted hydrogen prepared from impure sulphuric acid. This observation is now confirmed by Dr. R. Otto, who moreover finds that this contamination of the gas is not always avoided by the use of perfectly pure sulphuric acid, since the presence of arsenic in the ferrous sulphide leads to the same result. His suggestion, to prepare the gas in such cases by the action of pure hydrochloric acid on pure calcium sulphide (obtained by roasting gypsum with charcoal), will probably commend itself to the analyst. As another possible source of error in the search for poisonous metals, M. Battandier draws attention to the frequent presence of lead in glass-wool, which is now often employed for the filtration of liquids likely to corrode paper filters, and to the ease with which it yields this metal both to acids and to alkalis. Mr. Thresh recommends potassium iodide as a delicate reagent for bismuth, with which, in the presence of free hydrochloric acid, it produces an orange or yellow coloration even in exceedingly weak solutions. The well known property of glycerin, to prevent the precipitation of certain metallic hydrates by caustic alkalis, is regarded by M. Guyard as due to its viscosity and not to any chemical action. Dr. H. Precht describes a modification of Wildenstein's method for the volumetric estimation of sulphates, the main features of which are the following :—The sulphuric acid

is precipitated by an excess of normal barium chloride solution, the excess of barium removed by potassium chromate in the presence of sufficient sodium hydrate to render the mixture slightly alkaline, the whole mixture made up to a definite volume, and the excess of chromate then determined in a measured portion of the filtered liquid by acidifying with sulphuric acid and titrating with ferrous sulphate. The brown coloration produced by potassium chromate in solutions of tartaric acid is stated by M. Cailletet to afford a ready means of distinguishing this acid from citric acid, and of detecting the former as an adulterant in the latter. In a report on the purity of commercial cream of tartar, Dr. Paul shows that the calcium tartrate invariably occurring in this preparation is most probably the hydrated neutral tartrate $\text{Ca C}_4\text{H}_4\text{O}_6, 4\text{H}_2\text{O}$, and not the acid tartrate, $\text{Ca H}_3(\text{C}_4\text{H}_4\text{O}_6)_2$, for which some analysts are in the habit of calculating the amount of lime found by analysis. The insolubility of potassium permanganate in absolute alcohol, and its consequent failure to impart even the slightest coloration to it, induce Prof. Debrunner to recommend this salt as a most delicate indicator of the really anhydrous condition of the alcohol under examination. M. Bardy finds that the strength of glacial acetic acid can be ascertained with sufficient accuracy for commercial purposes by noting the proportion of oil of turpentine it is capable of dissolving. A new process for the estimation of tannin is published by Dr. Ostermayer, who employs for this purpose a standard solution of cinchonine sulphate coloured with magenta and slightly acidulated with sulphuric acid. This test-liquid is added to the tannin solution until the mixture begins to retain the colour of the magenta. A critical examination of Dr. Pavy's method of determining glucose leads Mr. O. Hehner to the conclusion that the amount of grape-sugar oxidized by the test solution is influenced to a large extent by the proportion of sodium hydrate present, and that the ratio given by Dr. Pavy holds good only when the ammoniacal copper solution contains from 80 to 150 grams of sodium hydrate per litre. With the proper amount of fixed alkali, however, the process is found to be very satisfactory, and the termination of the reaction sharply defined. Mr. J. Tattersall reports that the estimation of urea by means of sodium hypobromide is rendered inaccurate by the presence of glucose, since a considerable quantity of gas is evolved from the latter by the reagent, thus causing the results to be too high.

Messrs. F. Tiemann and C. Preusse have made a series of experiments, with the object of testing the relative merits of the prin-

cipal processes in use for the determination of organic matter in potable water. These results show inherent defects in each of these methods without establishing the decided superiority of any one of them over the rest. The same subject is very ably discussed in a pamphlet addressed to Medical Officers of Health, Sanitary Authorities, etc., by Mr. Ekin, who arrives at the conclusion that the chief methods employed, while more or less available for estimating the relative quantities of organic matter in potable waters, all fail alike in throwing satisfactory light on the nature of the organic impurity, the most important point to be determined. Organic matter, Mr. Ekin argues, may be present in considerable proportion and yet be perfectly harmless; while in other cases its quantity may be so small as to escape observation by the most delicate chemical tests, and yet the minute trace present may contain the germs of fatal disease. Waters of the latter description, in which the organic matter previously present has been more or less completely destroyed by oxidation, generally contain an excess of nitrates, which often constitute the only feature indicating contamination; and it is this fact which induces him to regard an excessive proportion of nitrates with greater suspicion than many other analysts are now in the habit of doing. The point most strongly insisted upon by him is, that it is not the mere determination of the amount of organic matter by one method or the other, but the collateral evidence afforded by the presence of nitrates, nitrites, chlorides, phosphates, etc., together with the source and history of the water, which throw light on the nature of the organic impurity. This is sound advice, and we believe it is as opportune as it is sound, considering the fact that water analyses are often performed by inexperienced persons, implicitly trusting to the indications of the one method to which they have accustomed themselves.

Among the remedies discussed in the scientific journals of the past year there are not many that can be properly regarded as new, the majority having met with previous notices. A few of them are very old indeed, and after many years' exclusion from the *Materia Medica* are now reintroduced to the notice of the profession as possessing remarkable curative properties. *Fucus vesiculosus*, which at one time was officinal in the Dublin Pharmacopœia, now appears again in the foreground, and is stated to possess considerable powers in removing superabundant fat from corpulent patients. No explanation, however, is offered as to the mode of action of this drug. Another remedy which, after being almost forgotten, has

again attracted much attention, is Chian turpentine, the oleo-resin of *Pistacia terebinthus*. This substance owes its renewed popularity to the successful results obtained with it by Prof. Clay, of Birmingham, in the treatment of uterine cancer. The great demand suddenly springing up for this article, after it had almost disappeared from the market, has led to the sale of spurious articles, and the reader will therefore be glad to find in this volume several articles dealing with the mode of testing this drug. *Micania Guaco* is mentioned as another remedy for cancer, and is stated by Dr. G. van Schmitt to be very efficient in the treatment of this malady. Long ago the juice of this West Indian plant was used in the treatment of snake bite, and both the juice and tincture were administered in cases of intermittent fevers, rheumatism, and gout. *Eriodictyon Californicum* is spoken of as a valuable remedy in lung diseases and brouchial affections. An analysis of this plant made by Mr. C. Mohr shows that its therapeutic value rests upon its stimulating effects on the respiratory organs, due to the action of its brittle, acrid resin exciting secretion and promoting expectoration, and to the astringent and tonic action of the tannin. An elixir and syrup of the same plant are recommended by Dr. M. Kier as excellent vehicles for disguising the taste of quinine and other bitter medicines. *Statice Caroliniana* is described as an efficient remedy for diarrhœa and dysentery, as a styptic in passive hemorrhages, and as an astringent in sore throat, owing its action in all these cases to the large amount of tannin contained in it. Mr. J. Jacobs has examined the bark of *Melia Azeradach*, and traces its activity as an anthelmintic to the yellowish white resin residing chiefly in the liber. In his opinion, the liber only ought to be employed. The efficacy of cusso is attributed by Prof. Arena, not to kosin, the principle isolated by Merck, but to the green bitter resin soluble in alcohol and ether. Mr. G. W. Kennedy confirms an observation previously made by Mr. C. H. Cressler (see *Year-Book of Pharmacy*, 1878, p. 202), that the anthelmintic properties of *Aspidium Filix mas* are not confined to this genus, but are shared in a marked degree by *Aspidium marginale*. A drug lately brought over from Fiji, and known by the name of *Tonga*, has attracted much attention on account of its reputed value as a remedy for neuralgia. It is described by Mr. Gerrard as a mixture of fibrous material, probably a root with portions of the inner bark and leaves of plants, the botanical sources of which are uncertain. A microscopic examination of this drug has enabled Mr. Holmes to refer its fibrous portion to a species of *Rhaphidophora*, probably *R. Vitiensis*,

the insects with ether or alcohol is quite insufficient for the complete extraction of the active principle. In addition to this analytical method he gives directions for a suitable treatment of the flies, calculated to render the whole of their cantharidin active in the plaster prepared from them. The animal drug known as *hyraceum*, and generally believed to be the inspissated urine of the *Cape Hyrax*, has been examined by Messrs. W. H. Greene and A. J. Parker, with results showing that the substance is undoubtedly derived from the urine of an animal, but that it also contains fecal matter.

Mr. H. Flowers has examined the lactucarium obtained from *Lactuca canadensis*, and finds, contrary to the statement of Aubergier, that this substance contains several bitter principles possessing a decided physiological action. *Ethusa Cynapium* has yielded to Mr. W. Bernhardt a volatile oily liquid possessing all the properties of an alkaloid, and differing from the so-called cynapin obtained by Ficinus in being uncrystallizable. The preliminary results of an examination of *Viola tricolor* by Mr. Mandelin convey the interesting information that this plant contains salicylic acid, and that this acid is present in it as such, and not in combination with alcohol radicals. M. Dal Sie reports the isolation from Persian insect powder of two acids, one of which is crystalline, while the other is an oily liquid of an aromatic odour. In his opinion, the active principle of these flowers is a volatile acid existing in them in the free state.

Mr. O. Hehner shows that the behaviour of decoctions of cinnamon and cassia towards iodine does not exhibit such a difference as has been asserted, and affords no test for the distinction of the two barks. He also publishes the results of a number of analyses of the ash of these barks, from which it appears that the ash of *Cassia lignea* contains more than five times the amount of manganese present in the ash of cinnamon bark.

Messrs. Jobst and Hesse supplement their previous researches on coto bark by a still fuller account of the various principles isolated by them both from this bark and the other variety known as "paracoto bark."

Among other vegetable drugs and plants not yet noticed in this chapter, which have likewise formed objects of chemical research during the past year, the following may be mentioned:—*Palmella cruenta*, *Andansonia digitata*, *Heracleum giganteum*, *Satureja juliana*, *Gastrolobium bilobum*, *Eupatorium perfoliatum*, *Teucrium fruticans*, *Pæonia peregrina*, *Anemopsis californica*, *Carica papaya*, *Bassia*

longifolia, *Lupinus luteus*, *Pachyrrhizus angulatus*, *Phytolacca decandra*, *Xanthoxylum carolinianum*, and *Thapsia garganica*.

The pages of this volume devoted to Pharmacy contain an account of some very interesting researches concerning dialysed iron. In one of these M. Personne arrives at the conclusion that this preparation is medicinally inactive, owing to its want of diffusive power and its complete insolubility in the gastric juice. Professor Redwood, in an elaborate paper on the diffusive properties of some preparations of iron, agrees with M. Personne on this point, and shows, among many other points of interest, that the oxide precipitated from dialysed iron, even when dissolved in hydrochloric acid, is practically devoid of diffusing power. The official scaled preparations of iron, on the other hand, are not deficient in diffusibility, though they share with dialysed iron the freedom from inky taste and astringent properties. Dr. Inglis Clark, who has likewise given this subject a considerable amount of attention, regards the inactivity of dialysed iron as by no means proved, and suggests the direct study of the effect of this preparation on the relative number of red blood corpuscles as the most satisfactory mode of ascertaining its therapeutic value.

Sweet spirit of nitre has received the attention of several investigators. As regards its mode of preparation, Mr. W. Smeeton expresses himself decidedly in favour of the Edinburgh plan, and gives directions for the preparation of a fairly pure nitrous ether, which may then be diluted with spirit in the desired proportion. Mr. F. M. Rimmington publishes analyses of commercial specimens of sweet nitre, showing a variation in the percentage of nitrite of ethyl from .07 to .75, while two typical samples, agreeing with the B. P. test, were found to contain 1.69 and 1.72 per cent. respectively. He also gives the details of a practical process for the complete analysis of this preparation. In addition to this, the present volume will be found to contain two other processes for the analysis of sweet nitre, one by Dr. Dupré, the other by Dr. Muter.

Experiments on taraxacum made by Mr. J. B. Barnes, lead to the conclusion than an alcoholic extract is in every sense superior to the extract of the British Pharmacopœia. As to the proper time for collecting dandelion root, Dr. C. Symes finds that it is best gathered in November or the beginning of December, at which time the bitter principle is more fully developed than at any other season.

Mr. H. Collier points out that tincture of senega possesses, like tincture of soap-bark, the power of emulsifying fatty oils, and attributes this action to the senegin or polygalic acid, which is

supposed to be identical with the saponin of quillaia bark. A small fraction of the medicinal dose of the tincture is stated to be sufficient for emulsifying a dose of either olive or other oil.

Mr. E. Dietrich reports that numerous experiments as to the best mode of preparing mercurial ointment have convinced him that the ointment can be made with ease and rapidity without the use of old ointment or additions of any kind. For this purpose it is only necessary first to incorporate a very small quantity of the mercury with the lard, and afterwards to add the bulk of the metal by degrees, first in small, and gradually in larger portions. Improved formulæ for the production of unguentum hydrargyri nitratis, clarified honey, and many other pharmaceutical preparations will also be found in this volume.

The gelatinization of tincture of kino has occupied the attention of Mr. R. Rother, who arrives at the conclusion that oxidation resulting from contact with air is the sole cause of the instability of this tincture, and that the change is in no way favoured or retarded by the presence or absence of light. He suggests the preservation of the tincture in small phials, well filled and securely stoppered, so as to exclude the action of the air. The decomposition occasionally observed to occur in tincture of foxglove is attributed by Dr. C. Binz to external conditions beyond the pharmacist's control. He finds that leaves from the same parcels sometimes yield an infusion which keeps well, and at other times one which gelatinizes. Mr. C. Bernbeck states that foxglove leaves of the first year's growth contain more pectin and pectose, but considerably less digitalin than those of the second year's growth; and that owing to these differences the directions of the Pharmacopœia with regard to the time for collecting these leaves ought to be strictly adhered to. With reference to the collection of narcotic herbs, Mr. W. Brandes insists on the decided superiority of the small leaves of wild-grown plants over the larger and finer ones of cultivated plants, and points out that in these cases efficacy is but too often sacrificed to appearance.

The Transactions of the British Pharmaceutical Conference, which follow the abstracts constituting the *Year-Book of Pharmacy*, contain a full account of the papers read and discussed at the Swansea meeting.

PHARMACEUTICAL CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

PHARMACEUTICAL CHEMISTRY.

The Meconates of Morphine. D. B. Dott. (Abstract of a paper read before the Pharmaceutical Society, and printed in the *Pharm. Journ.*, 3rd series, ix., 883.) Very little appears to be known respecting the combinations of morphine with meconic acid, or of the meconates in general. Beyond the statement that "meconate of morphine is an amorphous, extremely soluble substance," the ordinary books of reference seem to contain no information whatever concerning the morphine salts of this acid.

As meconic acid is generally regarded as tri-basic, the author endeavoured in the first place to prepare a tri-morphine meconate from three equivalents of morphine and one equivalent of meconic acid, using water as a solvent in one experiment and alcohol in another; but in neither case could any such combination be obtained. It was found that when the two substances were dissolved in the proportion named, pure morphine was first deposited, then a mixture of morphine and di-morphine meconate, and lastly di-morphine meconate alone. It is, therefore, very improbable that a tri-meconate of morphine can be formed.

Di-morphine meconate was found to be easily prepared by dissolving two equivalents of morphine and one equivalent of meconic acid in boiling water. The solution gradually deposits crystals in the form of tufts of prismatic needles, radiating from a common centre. These crystals lose the whole of their water of crystallization under a bell-glass over sulphuric acid, as there is no further loss of weight by drying in the water bath or even by exposure to a temperature of 120° in an air bath. The mean result of several

determinations of water and morphine (the latter by precipitation) was as follows :—

	H ₂ O.	C ₁₇ H ₁₉ NO ₃ ·H ₂ O.
Found	10.50 per cent.	66.80 per cent.
(C ₁₇ H ₁₉ N O ₃) ₂ C ₇ H ₄ O ₇ ·5 H ₂ O =	10.46 per cent.	70.46 „

The salt has the same composition, whether crystallized from water or from alcohol of 85 per cent. strength.

Attempts to produce a mono-morphine meconate, by dissolving in water morphine and meconic acid in the proportions of equal molecular weights, resulted in the formation of crystals which were found to be a mixture of di-morphine meconate and meconic acid. When, however, the same proportions of acid and base were dissolved in boiling alcohol, the strong solution deposited on cooling a viscous mass, regarded by the author as mono-morphine meconate. This compound was found to be so unstable that treatment with alcohol or with water, or even mere exposure to moist air, was sufficient to bring about a decomposition, resulting in the formation of di-morphine meconate and meconic acid.

From the results obtained only one well-defined crystalline combination of morphine and meconic acid can be positively asserted to exist, namely, the di-morphine meconate, (C₁₇H₁₉N O₃)₂·C₇H₄O₇·5 H₂O. In addition to this, the author's experiments afford evidence of the existence of an amorphous mono-meconate, which most readily splits up into the di-basic salt and meconic acid.

The Estimation of Morphine in Opium. A. B. Prescott. (*Journ. Chem. Soc.*, March, 1880, and *Pharm. Journ.*, 3rd series, x., 128, 130, and 182–185, from *Proc. Amer. Pharm. Assoc.*) The author submits the following assay process for opium; it is essentially the Hager-Jacobsen, but it is modified by a preliminary washing of the opium with benzol, to remove impurities.

6.5 grams of opium, perfectly dried at 100° C., and powdered before weighing, are placed on a paper filter of 10 c.m. diameter in a funnel; benzol is poured on until the powder is covered, and as soon as it begins to drop through, the funnel is closed at its lower extremity, and the contents left to macerate for an hour, after which the benzol is allowed to percolate, with the occasional addition of fresh portions until the whole volume used is 55 c.c. The filter and its contents are dried at a gentle heat until there is no further smell of benzol, when the contents are transferred to a weighed flask of 120 c.c. capacity, the filter being kept for further use. 20 c.c. of water are now added, together with 3 grams of lime previously slaked with one-third of its weight of water. After agita-

ting the mixture for several minutes, it is made up by further additions of water to 74.2 grams, and heated with occasional agitation for an hour by placing the flask in water kept near the boiling point, the water thus lost by evaporation being replaced at the end of the time. The solution is filtered through the paper previously used into a vessel of about 80 c.c. capacity marked for a volume of 50 c.c. As soon as exactly 50 c.c. are obtained, the contents of the filter being gently squeezed, if necessary, to yield the last few drops, it is mixed with 8 drops of benzol and 3 c.c. of washed ether, the vessel closed, and the whole well shaken. After this 4.5 grams of powdered ammonium chloride are dissolved in the mixture, which is now once more agitated and then set aside in a cool place for three hours and a half. The crystalline deposit formed during this time is collected on a weighed and moistened filter, washed several times with minute quantities of water, then dried at about 50° C., next washed with 3 c.c. of washed ether, dried again, and weighed. Allowing for loss during filtration, etc., the weight of morphine thus obtained may be considered as that contained in 5 grams of opium, and its percentage found by multiplying this weight by 20.

Opium perfectly dried at 100° C. should yield from 10 to 12 per cent. of morphine.

The author also submitted different processes for estimating morphine to a comparative trial, by analysing several samples by each of the methods, then estimating by Mayer's volumetric method the purity of the morphine obtained, and also determining the morphine remaining uncrystallized in the mother-liquor by extraction with amyl alcohol and titration. Mayer's solution was prepared by dissolving 13.55 grams of dry mercuric chloride and 49.84 grams potassium iodide in water, and making up to a litre; 1 c.c. corresponds to 0.02 gram morphine. The morphine precipitates were dissolved in water acidulated with sulphuric acid, and so far diluted that at the end of the titration the solution amounted to 200 parts to 1 of morphine, this precaution being necessary because of the solubility of the precipitate in water. The author finds that the results obtained by Mayer's process are more accurate than those yielded gravimetrically after purification of the crystals, but they are probably somewhat low. The morphine remaining in the mother-liquor was partially separated by allowing a further time for crystallization, and the filtered liquid was then well shaken with amyl alcohol in successive portions of 15, 10, and 5 c.c.; the alcohol was separated and evaporated, and the residue titrated by Mayer's solution.

The conclusions arrived at are that hot benzol, if used for the preliminary treatment, occasions a greater loss of morphine than cold benzol; the cold benzol, however, must be used in limited quantity, since it dissolves some morphine. The omission of the preliminary treatment with benzol leaves the opium-lime mixture loaded with opium wax, and renders the filtration more difficult, and the entire operation less satisfactory, but the results after deduction of one-tenth (or one-thirtieth if ether-washed) are fairly in accordance with those obtained by the modified process of treating with benzol. The Procter-Staples process yielded unsatisfactory results, more especially in the estimation of morphine extracted from the mother-liquor by amyl alcohol. The author suspected that something besides the alkaloid, which acted on Mayer's solution, was taken up by amyl alcohol. It was found more satisfactory to extract the mother-liquor obtained by Staples' process, first with benzol, and afterwards with amyl alcohol. By Hager's process the filtrate contained in solution 1.9 times as much as pure water, and by Staples' process 2.45 times as much. Schachtrupp's process for estimating morphine and narcotine in opium (*Zeitschr. für analyt. Chem.*, 1868, 509) was also submitted to examination; the author pronounces it to be untrustworthy and inexpedient; the experiments made by this process, however, proved that benzol does not extract the whole of the narcotine from opium, unless an alkali is present, and therefore the preliminary treatment with benzol does not dispense with purification of the morphine crystals by washing with ether freed from alcohol and acetic acid by recent agitation with water; the impurities left in the morphine may then be considered as counterbalancing the morphine left in the mother-liquor, and removed by washing.

Estimation of Morphine in Opium. Dr. E. Mylius. (*Archiv der Pharm.*, October, 1879, 310.) The author's process is a modification of Prof. Flückiger's, and is carried out as follows:—8 grams of air-dried and powdered opium are macerated with 80 grams of water for twelve hours, and then thrown on a filter. 42.5 grams of the filtrate, representing 4 grams of opium, are mixed in a flask of about 100 c.c. capacity with 12 grams of rectified spirit, 10 grams of ether, and 1.5 gram of solution of ammonia. The mixture is set aside for twenty-four hours, at the expiration of which the morphine crystals formed are transferred to a small filter and washed with 10 grams of a mixture of equal volumes of ether and alcohol. The filter is next pressed between bibulous paper and dried at 100° C. for half an hour, after which it is again allowed to absorb moisture by

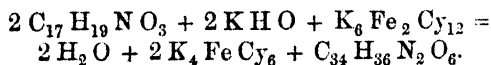
exposure to the air for half an hour, in which condition it is weighed. After removing the morphine from the filter the latter is again weighed, and its weight deducted from that previously determined. To make a correction for the loss incurred, .088 gram is added to the net weight of morphine found. The number thus obtained represents the amount of this alkaloid in 4 grams of opium.

Morphine Tartrate. E. Stuart. (*Pharm. Centralhalle*, 1879, 434.) This salt is recommended in preference to the hydrochlorate and acetate for hypodermic injections, owing to its greater solubility. It is obtained by dissolving 10 grams of pure morphine and 2.5 grams of tartaric acid in 40 grams of hot distilled water, and allowing the solution to evaporate at a moderate heat. It forms needle-shaped crystals perfectly neutral to test paper and very soluble both in water and alcohol.

Solubility of Morphine in Alcohol and Chloroform. Prof. van der Burg. (*Pharmaceut. Zeitung*, 1879, 696.) One part of pure morphine requires 15,000 parts of absolute alcohol to form a solution. 150 parts of chloroform containing 10 parts of alcohol dissolve 1 part of the pure alkaloid, but a much larger proportion if the morphine be contaminated with narcotine.

The Purity of Hydrochlorate of Morphine. Dr. H. Tausch. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 65-69, and 82-85.) The author finds that commercial hydrochlorate of morphine is rarely quite pure, but generally contains a variable amount of resinous substances. Samples thus contaminated show a brown or black coloration when heated to 130° C., while the pure alkaloid, similarly treated, is not altered in appearance. He also notices an inconsistency in the composition of commercial samples, and points out that, when dried at 100° C. for some time, hydrochlorate of morphine not only parts with the free hydrochloric acid adhering to it mechanically, but also with its molecule of water of crystallization; so that the dried product contains about 15 per cent. more of alkaloid than the air-dried salt.

Action of Potassium Ferricyanide on Morphine. K. Polstorff. (*Ber. der deutsch. chem. Ges.*, xiii., 86.) The author confirms Kieffer's observation that the action of an alkaline solution of potassium ferricyanide on morphine results in the conversion of this alkaloid into oxydimorphine in accordance with the following equation:—



By precipitating the hydrochloric acid solution with ammonia, pure oxydimorphine is obtained in the form of a colourless heavy crystalline powder corresponding in its composition with the formula $C_{34}H_{36}N_2O_6 + 3H_2O$. It is insoluble in the ordinary solvents. It is precipitated from solutions of its salts by caustic alkalies, but is redissolved by an excess of the precipitant. With sulphuric and hydrochloric acids it forms crystallizable salts, the composition of which is represented by the formulæ $C_{34}H_{36}N_2O_6 \cdot H_2SO_4 + 8H_2O$ and $C_{34}H_{36}N_2O_6 \cdot 2HCl + H_2O$, the latter salt containing a variable amount of water of crystallization.

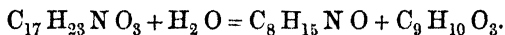
Identity of Oxy-morphine with Oxydimorphine. K. Broockmann and K. Polstorff. (*Ber. der deutsch. chem. Ges.*, xiii., 92.) Oxy-morphine, the body prepared by Schützenberger by the action of silver nitrite and hydrochloric acid on morphine, is found by the authors to be identical with oxydimorphine, obtained from morphine by the action of potassium ferricyanide. (See the foregoing article.) The same body is also formed when morphine is oxidized by means of potassium permanganate in the presence of an alkaline carbonate, or when an ammoniacal solution of morphine is exposed to the air. By whichever of these modes of treatment the oxidation of the morphine is effected, the result is always the same.

A New Test for Papaverine and Codeine. J. Tattersall. (*Pharm. Zeitschr. für Russland*, 1879, 721.) The substance to be tested is heated with a few drops of sulphuric acid until dissolved; a small fragment of sodium arseniate is then added, and the solution again heated for some time. A dark bluish violet colour is finally obtained, which is very stable. After cooling, about 10 c.c. of water are added; the now orange-coloured liquid is poured into a bottle, diluted, and caustic soda added until distinctly alkaline, when the liquid turns almost black. Strychnine, brucine, morphine, salicin, atropine, narcotine, narceine, digitalin, picrotoxin, curarine, colchicine, and cantharadin do not exhibit this reaction, becoming, on subsequent addition of alkali, light orange or dirty yellow.

Codeine, when heated with sulphuric acid and sodium arseniate gives a fine deep blue colour, much darker than the one produced by ferric chloride under the same conditions. On addition of water and an alkali this becomes orange, and is characteristic of the alkaloid.

Artificial Artropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xii., 941.) It has previously been shown by Kraut and Lossen (*Liebig's Annalen*, cxxxviii.) that atropine when treated with solu-

tion of barium hydrate splits up into tropine and tropic acid in accordance with the following equation,—



Making this reaction the basis of synthetical experiments, the author succeeded in reproducing the original alkaloid from the decomposition products named, by acting upon tropine tropate with dilute hydrochloric acid below 100°C . The tropine tropate used in these experiments was absolutely free from atropine.

The atropine thus obtained did not differ in any respect from the natural alkaloid.

Tropidine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xii., 944.) A continuation of the author's experiments referred to in the foregoing article has yielded him a new liquid base, tropidine, which corresponds to the formula $\text{C}_8\text{H}_{13}\text{N}$, and thus appears to occupy an intermediate position between collidine, $\text{C}_8\text{H}_{11}\text{N}$, and conine, $\text{C}_8\text{H}_{15}\text{N}$. With the chlorides of gold and platinum this base forms crystalline double salts of the formulæ $(\text{C}_8\text{H}_{13}\text{N} \cdot \text{H Cl})_2\text{Pt Cl}_4$, and $\text{C}_8\text{H}_{13}\text{N} \cdot \text{H Cl Au Cl}_3$.

Tropidine is prepared by the action of strong hydrochloric acid at 180°C . on a mixture of tropine and glacial acetic acid, and purifying the crude product by saturation with potash and subsequent extraction with ether.

On allowing the ethereal solution to evaporate, the base is left in the form of an oily liquid, which is soluble in a small quantity of water, but partly separates from the solution as more water is added. It boils at 162°C ., and has a specific gravity of .9665 (at 0°C .)

The Preparation of Artificial Alkaloids. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 104.) By a further study of the properties of atropine synthetically prepared from tropine tropate, and a close comparison with those of the natural alkaloid, the author has established the perfect identity of the two bases.

His success in the artificial preparation of atropine from tropine tropate, by the action of dilute hydrochloric acid, induced him to extend the same treatment to other tropine salts, in the expectation of thus producing other bases analogous to atropine. This anticipation has been realized, and a new class of similar alkaloids formed, which the author proposes to name *tropeines*. Three of these are described in his paper, viz., *salicyl-tropeine*, *oxytoluyl-tropeine*, and *phthalyl-tropeine*. Of these, the first named is a weak poison having no effect on the pupil of the eye. Oxytoluyl-tropeine, or homatro-

pine, as he proposes to call it, acts upon the pupil almost as powerfully as atropine, while its mydriatic action appears even to surpass the latter. The action of phthalyl-tropeine has not yet been sufficiently investigated.

The author considers it as not improbable that hyoscyamine and duboisine may also belong to the class of tropeines.

Hyoscyamine and its Isomerism with Atropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 106 and 254.) The hyoscyamine experimented with was prepared from the purest product hitherto known, by converting it into the gold salt, recrystallizing the latter from a hot aqueous solution, decomposing with sulphuretted hydrogen, then precipitating with potassium carbonate, and repeatedly dissolving the product in a small quantity of alcohol and reprecipitating with water. Thus purified it was found to melt at 108.5°C ., and to answer to the formula, $\text{C}_{17}\text{H}_{23}\text{NO}_3$, its gold salt having the composition $\text{C}_{17}\text{H}_{23}\text{NO}_3 \cdot \text{HCl} \cdot \text{AuCl}_3$.

Hyoscyamine is, therefore, isomeric with atropine, but owing to decided differences in the physical properties of the two bases and of their gold salts, the author does not regard it as identical with it.

Barium hydrate splits up hyoscyamine in a similar manner as atropine, the resulting decomposition products being in either case hyoscinic acid and hyosicine. The formulæ as well as the fusing points and other physical properties of these two products were the same as those of tropic acid and tropine respectively, both of which—it will be remembered—are obtained in the same manner from atropine. Nevertheless, the author does not regard the identity of hyoscinic acid with tropic acid, and that of hyosicine and tropine as definitely proved, and thinks that the difference undoubtedly existing between atropine and hyoscyamine may be explained by one or the other of the following assumptions:—(1) That hyoscinic acid is different from tropic acid; (2) That hyosicine is different from tropine; or (3) That the decomposition products of hyoscyamine and atropine are identical, but that the components of the two bases are differently united, so that their isomerism may be of a character analogous to that existing between oil of gaultheria and methyl-salicylate. He hopes that a close study of their tropeines will enable him to settle the question of identity.

Identity of Duboisine and Hyoscyamine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 257.) Duboisine is the alkaloid isolated from the leaves of *Duboisia myoporoides*, an Australian solanaceous plant, by Gerrard in 1878 (*Year-Book of Pharmacy*, 1878, p. 266). The physiological properties of this base were

studied at that time by Drs. Ringer and Murrell, and found to agree very closely with those of atropine; but Gerrard's observations of its chemical and physical properties pointed rather to the non-identity of the two alkaloids.

The author prepared the gold salt of duboisine, and after repeated purification of this compound obtained from it the pure base in a crystalline condition. The composition of the gold salt was found to answer to the formula $C_{17}H_{23}NO_3 \cdot HCl \cdot AuCl_3$. Its properties were the same as those of the corresponding salt of hyoscyamine, and the qualitative reactions of the base itself, and those of the latter, likewise showed no difference. He therefore regards duboisine and hyoscyamine as identical.

Identity of Daturine with Hyoscyamine and Duboisine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 380.) Soon after pointing out the identity of duboisine with hyoscyamine, the author obtained equally strong indications that daturine, also, is identical with the same base. As in the other cases, he operated on the purified gold salt, and prepared from this the alkaloid itself in a perfectly pure condition. Here again the composition and properties of the gold salt were found to be the same as in the case of hyoscyamine.

Picric acid produces in the acid solution of daturine, hyoscyamine, or duboisine, an oily precipitate rapidly solidifying to right-angled lamellæ. Tannin produces only a slight turbidity in the acid solution, but a copious one after neutralization. Mercuric potassium iodide forms a white curdy, and iodized potassium iodide a brown, precipitate. Platinum perchloride, mercuric chloride, and potassium ferrocyanide form no precipitates.

The author's researches point to the conclusion that, so far as is known at present, there appear to occur in nature only two mydriatic alkaloids, viz., atropine and hyoscyamine. These two bases are isomeric, and are very closely related to each other.

Conversion of Hyoscyamine into Atropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 607.) Continuing his researches on the solanaceous alkaloids, the author now reports that he has succeeded in converting hyoscyamine into atropine. As stated in one of his previous papers, hyoscyamine can be split up by barium hydrate into hyoscyne and hyoscyneic acid, in the same manner as atropine is resolved into tropine and tropic acid. His most recent investigations have convinced him of the perfect identity of the two acids, hyoscyneic and tropic, and of the two secondary alkaloids, hyoscyne and tropine. Having established this identity, his efforts

were next directed to the artificial production of atropine, not from tropine tropate as before, but from the corresponding decomposition products of hyoscyamine or daturine. The attempt proved a complete success. The following products were submitted to the treatment with dilute hydrochloric acid :—

1. Tropine prepared from atropine, and hyoscinic acid from daturine.

2. Hyoscyne prepared from hyoscyamine, and tropic acid from atropine.

3. Hyoscyne from daturine, and hyoscinic acid from hyoscyamine.

In each case the resulting alkaloid was converted into the gold salt, and the latter purified by repeated recrystallization from hot water.

The three gold salts thus prepared were in every respect identical.

These experiments prove that hyoscyamine can be converted into atropine, and *vice versa*, and that both alkaloids yield on treatment with barium hydrate or hydrochloric acid identical decomposition products.

Daturine and Atropine. Dr. E. Schmidt. (*Ber. der deutsch. chem. Ges.*, xiii., 370.) The author has carefully compared samples of daturine and atropine, and has failed to detect any difference between the two bases. Both agree in composition, melting point, rotatory power, behaviour towards reagents, and the composition and properties of their platinum and gold salts.

Beberine. D. B. Dott. (Abstracted from a paper read before the North British Branch of the Pharmaceutical Society, and printed in the *Pharm. Journ.*, 3rd series, x., 612.) Previous researches by Walz, Flückiger, and others, prove the identity of beberine, buxine (the alkaloid of *Buxus sempervirens*), and pelosine (from *Cisampelos Pareira*), but leave the composition of these bodies in an unsettled condition, owing to the difficulty of obtaining well-defined crystalline compounds or derivatives.

At the Dublin meeting of the British Pharmaceutical Conference, the author announced that he had obtained the hydrochloride of beberine in a crystalline form; and since then he has been able to satisfy himself that the alkaloid produced by him was really pure beberine. The hydrochloride was recrystallized several times, and the base precipitated from its solution by ammonia. Thus obtained and dried at the ordinary temperature, beberine is a white, amorphous substance, which loses water by exposure to the heat of a

water-bath. It is a monacid base of a well marked alkaline character, being capable of decomposing ammonium salts when warmed with their solutions. This property is only possessed by the stronger alkaloids, such as codiene and morphine, and not by the weaker members of the class, such as papaverine and narcotine. Beberine combines to form readily soluble salts with hydrochloric, nitric, sulphuric, acetic, tartaric, citric, and oxalic acids. The hydrochloride crystallizes in minute four-sided prisms from an aqueous solution. If the solution is neutral, it is apt to assume the form of a transparent jelly. The only other salt the author has obtained in the crystalline form is the nitrate. It is almost characteristic of the salts of beberine that their solutions yield precipitates with such a variety of reagents. These include hydrochloric, hydriodic, and nitric acid, potassium ferricyanide and ferrocyanide, sodium phosphate, nitrate and iodide, and mercuric chloride. Beberine forms a deep red solution with strong nitric acid, which on dilution with water gives a bulky precipitate; but this reaction is not to be considered characteristic of the alkaloid; and the author has tried in vain to devise some colour test which should be conclusive evidence of its presence.

Analysis of the crystallized hydrochloride and of the platinochloride show that the composition of beberine is represented by the formula $C_{18}H_{21}NO_3$, which agrees with the one assigned by Bödeker to peline.

Citrates of Quinine. K. F. Mandelin. (*New Remedies*, 1879, 259.) The author first gives an historical review of the labours of others, and then proceeds to give an account of his own investigations. He brought together citric acid and quinine in four different proportions, and analysed the resulting crystallized salts with the following results:—

1. Three molecules of quinine and two molecules of citric acid. He obtained a salt containing 0.3963 per cent. of water, 72.99 of anhydrous quinine, and 26.62 of citric acid, and corresponding to the formula $3(C_{20}H_{24}N_2O_2), 2H_3C_6H_5O_7$.

2. One molecule of quinine and one molecule of citric acid. The resulting salt was anhydrous and contained 64.55 per cent. of anhydrous quinine, and 35.45 of citric acid, the formula for which is $C_{20}H_{24}N_2O_2, H_3C_6H_5O_7$.

3. One molecule of quinine and two molecules of citric acid gave a salt containing, when dried in the air, 0.60 per cent. of water, 63.79 of anhydrous quinine, and 35.59 of citric acid (calculated by difference). The composition is, therefore, probably the same as

that of the preceding salt. Hesse has already stated that by treating one molecule of quinine with a little more than one molecule of citric acid, a salt of the composition $C_{20}H_{24}N_2O_3, H_3C_6H_5O_7$ is obtained.

4. Two molecules of quinine and one molecule of citric acid. This salt contained 1.14 per cent. of water, 78.28 of anhydrous quinine, and 20.32 of citric acid. Composition, 2 ($C_{20}H_{24}N_2O_2$), $H_3C_6H_5O_7, \frac{1}{2}H_2O$.

The solubility of the three obtained citrates is as follows, in 100 parts of water :—

		Cold. Parts.	Boiling. Parts.
Basic Quinine Citrate :	2 ($C_{20}H_{24}N_2O_2$), $H_3C_6H_5O_7$	0.1023	2.25
Neutral „ „	3 ($C_{20}H_{24}N_2O_2$), 2 ($H_3C_6H_5O_7$)	0.1133	2.39
Acid „ „	$C_{20}H_{24}N_2O_2, H_3C_6H_5O_7$	0.1566	2.60

The Salicylates of Quinine. P. YVON. (*Journ. de Pharm. et de Chim.*, August, 1879.) The author gives the following directions for preparing the *basic* and the *neutral* salicylate :—

1. Basic Salicylate of Quinine.

Basic Sulphate of Quinine	. . .	4.36 grams.
Salicylate of Sodium	. . .	1.60
Distilled Water	. . .	50.00 „

Dissolve the salicylate of sodium in the distilled water, heated to boiling, then add the quinine salt. Salicylate of quinine, which is not soluble in such a small quantity of (even boiling) water, is precipitated. After continuing the heat a short time the liquid is allowed to cool to 35° C. (95° F., at which point sodium sulphate is most soluble), then filtered, and the precipitate on the filter washed, first with warm, and afterwards with cold water, until the wash-water is no longer rendered turbid by barium chloride. The precipitate, when dry, contains 1 molecule of quinine, 1 of salicylic acid, and 1 of water. The salt is soluble in 900 parts of water.

2. Neutral Salicylate of Quinine.

Neutral Sulphate of Quinine	. . .	5.48 grams.
Salicylate of Sodium	. . .	3.20 „
Distilled Water	. . .	60.00 „

Dissolve the two salts separately in one-half of the water, and mix. The salicylate separates in small needles which rapidly agglutinate to a sticky mass. This salt, when dry, contains 1 mole-

oule of quinine, 2 of salicylic acid, and 5 of water. It is soluble in 406 parts of water.

The Composition of Cinchonine and Cinchonidine. Z. H. Skraup. (*Liebig's Annalen*, cxvii., 266 and 352.) The results of numerous careful analyses of pure cinchonine and cinchonidine have fully convinced the author that the correct formula of these bases is $C_{19}H_{22}N_2O$, and not $C_{20}H_{24}N_2O$.

The Oxidation of Quinine. S. Hoogewerff and W. A. van Dorp. (*Ber. der deutsch. chem. Ges.*, xii., 1287.) The authors correct two errors occurring in their previous report on the oxidation of quinine sulphate by potassium permanganate. Instead of a mixture of pyridinecarbonic acids, as there stated, pyridinetricarbonic only has been obtained by them by this oxidation. The ratio of permanganate to quinine sulphate used in these experiments was 8.5 to 9.5 to 1.

Oxidation Products of Cinchona Bases. Z. H. Skraup. (*Ber. der deutsch. chem. Ges.*, xii., 230-234, and 1104-1111.) The author confirms Koenig's statement that the correct formula for cinchonic acid is $C_{10}H_7NO_2$, and not $C_{20}H_{14}N_2O_4$, as found by Weidel. The latter formula was based on the observation that by oxidation cinchonic acid yielded *chinolic acid*, $C_9H_6N_2O_4$, and *cinchomeronic acid*, $C_{11}H_8N_2O_6$, but in the author's opinion the last named acid is probably dicarbopyridenic acid, $C_7H_5NO_4$.

Cinchonine and cinchonidine, $C_{19}H_{22}N_2O$, when oxidized with potassium permanganate yield cinchotenine and cinchotenidine respectively with formic acid. Bichromate acts at first in the same way, but the oxidation in this case proceeds further, the formic acid being converted into carbonic acid, and the bases cinchotenine and cinchotenidine into cinchonic acid. Hence cinchonine, cinchonidine, cinchotenine, and cinchotenidine, when treated with bichromate in the presence of sulphuric acid, all yield cinchonic acid, in the case of the two former with, and in that of the two latter bases without, the evolution of carbonic acid gas.

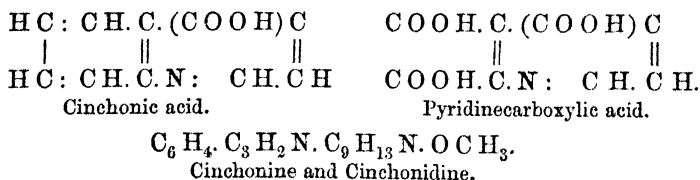
Caventon's *carboxycinchonic acid* is regarded by the author as identical with cinchonic acid.

The oxidation of quinine in sulphuric acid solution by means of permanganate yields *chitenine*, $C_{19}H_{22}N_2O_4$, and formic acid, the former of which may be extracted from the precipitated manganese dioxide by boiling alcohol. It is a weak base crystallizing in colourless prisms, insoluble in ether and alcohol but freely soluble in acids and in water rendered alkaline by a slight addition of potash or ammonia.

By oxidizing quinine with chromic acid, *quininic acid*, $C_{11}H_9NO_8$, is formed and may be separated by neutralizing the product with barium hydrate, decomposing the barium salt with sulphuric acid, and evaporating the solution to the point of crystallization.

The formation of formic acid together with a substance possessing the properties of an alcohol or phenol, during the oxidation of cinchonine, cinchonidine and quinine, point, in the author's opinion, to the presence of a methoxyl group in these bases.

Constitution of Cinchonine and Cinchonidine. Z. H. Skraup. (*Liebig's Annalen*, cci. 291-333.) The following conclusions were deduced from the results of the author's investigations on the oxidation products of cinchonine, cinchonidine, and cinchonic acid. In the oxidation of chinoline and cinchonidine by chromic mixture, the methoxyl group is first attacked with formation of formic acid and carbonic anhydride, probably of cinchotenine and cinchotenidine or closely allied compounds as intermediate products. Cinchonic (quinoline monocarboxylic) acid, $C_{10}H_7NO_3$, and a non-crystalline acid which forms exceedingly hygroscopic salts are the results of the reaction. Cinchonic acid is monobasic and does not form acid salts as stated by Weidel (*Wien. Akad. Ber.*, 1874, Part II.). On further oxidation it yields pyridine-tricarboxylic acid, which is identical with Weidel's oxycinchomeronic acid, and with the pyridine-tricarboxylic acid obtained by Hoogewerff and Van Dorp (*Ber.* xiii. 152) by the action of potassium permanganate on quinine, quinidine, cinchonine, and cinchonidine. The constitution of these acids and of cinchonine and cinchonidine may be represented by the following formulæ:—



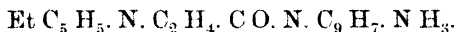
The tricarboxylic acid decomposes when heated at its melting point, with evolution of carbonic anhydride and production of the dicarboxylic and of monocarboxylic acids. The latter acid melts at 305° , and sublimes without decomposition.

Derivatives of Cinchonine. A. Wischnegradsky. (*Ber. der deutsch. chem. Ges.*, xii., 1480-1482. From *Journ. Chemical Society.*) Butlerow and the author have shown (*Ber.* xi., 1235) that cinchonine, under certain as yet undefined conditions, is decomposed by

fusing potash into chinoline and a base which they have further resolved into a fatty acid and ethyl-pyridene. The latter base is a pleasantly-smelling liquid (b. p. 166°), soluble in water with difficulty. It combines with platinic and mercuric chlorides, and by oxidation with a 30 per. cent. chromic acid solution in presence of sulphuric acid, yields Laiblin's *monocarbo-pyridenic* (nicotinic) acid, $C_7H_9N + 3O_2 = C_6H_5O_2N + CO_2 + 2H_2O$. It is isomeric, or identical with Anderson's *lutidine*.

With regard to chinoline, the author finds that by oxidation with chromic and sulphuric acids, it yields Ramsay and Dobbie's *dicarbo-pyridenic acid* (*Year-Book of Pharmacy*, 1879, p. 59), obtained by oxidation of cinchonine. This reaction harmonizes with Körner's view of its constitution, confirmed by Baeyer and König's synthesis, viz., that it is naphthalene, in which the group CH has been replaced by N. By reduction with zinc and hydrochloric acid, chinoline yields a resinous base, which forms uncrystallizable salts, and a base having nearly the same boiling point as itself, and forming a crystalline compound with hydrochloric acid.

These experiments lead to the conclusion that cinchonine contains a *methyl-chinoline* and an *ethyl-pyridine* nucleus. By the addition of hydrogen, the double union of carbon and nitrogen in the two nuclei may be supposed to be loosened, and from the hypothetical *secondary* bases thus formed, cinchonine may be constituted by the intervention of the acid radical, $CH_3 \cdot CH \cdot CO$ or $CH_2 \cdot CH_2 \cdot CO$, thus:—



By oxidation these hydrogenated bases are reconverted into the tertiary bases (or their derivatives), pyridine and chinoline. Fusing potash acts on cinchonine in two ways: partly by oxidizing it to cinchonic acid, and partly by decomposing it, with reduction, into methyl-chinoline. The potash further decomposes the cinchonic acid with formation of chinoline. As a fact, chinoline prepared from cinchonine always contains methyl-chinoline or lutidine (Williams and Wischnegradsky).

If the constitution of cinchonine given above is correct, it should be obtained synthetically by acting with dihydro-lepidine and dihydroethyl-pyridine on the chloranhydride of one of the chloropropionic acids.

Homocinchonidine. Z. H. Skraup. (*Liebig's Annalen*, cxcix. 359.) The author believes Hesse's homocinchonidine to be identical with cinchonidine. He has carefully compared the two bases and has not been able to establish any difference in their com-

position, crystalline form, fusing point, and rotatory power, nor in the properties of their salts. Both answer to the formula $C_{19}H_{22}N_2O$.

Quinamine. A. C. Oudemans. (*Liebig's Annalen*, cxcvii. 48.) This alkaloid may be conveniently prepared from quinetum, the mixture of alkaloids obtained from *Cinchona succirubra*. It is left in the filtrate together with cinchonine after the quinine and cinchonidine have been thrown down from the faintly acid solution of the hydrochlorates in the form of tartrates. From this filtrate quinamine is obtained by precipitating with soda, exhausting with ether, evaporating the ethereal solution and purifying the product by repeated crystallization from alcohol. Quinamine can be readily distinguished from the other cinchone alkaloids by the following tests. With strong sulphuric acid containing a little nitric acid it produces an orange-brown coloration which changes to purple and pink on the addition of water. A strip of paper moistened with a sulphuric acid solution of quinamine, when placed over a vessel in which chlorine peroxide is evolved, exhibits a brown stain changing to blue on exposure to the air and turning pink when moistened with water. The alkaloid is soluble in 50 parts of ether.

Quinamine is dextrogyrate. Its solutions in acidulated water show the greatest rotatory power when one molecule of a monobasic acid or half a molecule of a dibasic acid is used for each molecule of the alkaloid.

The salts of quinamine described in the author's paper comprise the nitrate, chlorate, perchlorate, formate, and platinochloride, besides others previously described by Hesse.

The analytical results recorded by the author leave it doubtful whether $C_{20}H_{26}N_2O_2$ or $C_{19}H_{24}N_2O_2$ is the correct formula for this alkaloid.

Quinamine. Dr. O. Hesse. (*Liebig's Annalen*, cxcix. 333.) The author's analyses of pure quinamine prove that the older formula, $C_{20}H_{26}N_2O_2$, must be given up in favour of $C_{19}H_{24}N_2O_2$.

The rotatory power of this alkaloid is greatest when it is dissolved in water acidified with hydrochloric acid; it is less in alcohol and much less in chloroform solutions.

Hydrochlorate of Quinine and Urea. M. Drygin. (*Journ. de Pharm. et de Chim.*, 1879, 342.) This combination is obtained by dissolving 396.5 parts of hydrochlorate of quinine in 250 parts of hydrochloric acid of 1.07 sp. gr., then adding 60 parts of urea, agitating till the urea is dissolved, and allowing the solution to stand in a cold place for twenty-four hours. The crystals found

deposited after this time are washed with a small quantity of cold water and dried at an ordinary temperature.

This salt is soluble in an equal weight of cold water and contains 60 per cent. of quinine. It is recommended both for internal and hypodermic use, but chiefly for the latter.

Hydrochlorate of Quinine and Urea. K. Jaffé (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 342.) The author has given this preparation an extensive trial, and reports very favourably upon its value for hypodermic use. Its anti-pyretic effects were in all cases exceedingly well marked, without being accompanied by headache and other unpleasant symptoms so often resulting from the internal administration of quinine. He most strongly recommends its use for children, for sensitive persons liable to become nauseated by the bitter taste of quinine, and for patients troubled with gastric symptoms. He also speaks of it as a very cheap remedy particularly suited for use in hospitals, as the injection of a very small quantity produces the effect of a much larger proportion of quinine internally administered.

The Preparation of Berberine and its Salts. J. V. Lloyd. (From the *Proceedings of the American Pharmaceutical Association.*) Of the various processes investigated by the author, he suggests the following as most applicable to small quantities:—

Moisten sixteen troy ounces of *Hydrastis canadensis* in fine powder with eight fluid ounces of alcohol, press firmly into a cylindrical percolator not exceeding three inches in diameter, previously prepared for percolation; cover the surface of the powder with a piece of blotting-paper held in position with a few fragments of glass; add alcohol until the percolate appears at the exit, then close the orifice, cover the top of the percolator tightly by tying over it a piece of soft rubber, and leave the percolator in a warm place. Allow to macerate for twenty-four hours, after which remove the rubber and replace it with a cover of glass or tin. Cautiously open the exit and graduate the dropping so that the passage of each fluid ounce will occupy about thirty minutes. Suspend the operation when five fluid ounces have been obtained. Macerate until the next day under the former conditions, and again procure five fluid ounces of percolate, observing the preceding directions. A continuous supply of alcohol must be provided. The surface of the powder should not become exposed during the operation. Mix the percolates, surround the vessel with ice, and reduce the temperature, then add sulphuric acid in excess and stir well. Keep the mixture cold for twelve or more hours, then pour it upon a muslin strainer

or a filtering paper, and when the liquid ceases to pass, return the precipitate to a vessel containing eight fluid ounces of cold alcohol; mix well together and again separate the crystalline precipitate of impure sulphate of berberine. Dry by exposure to the air.

Sulphate of Berberine.—Add one part of impure sulphate of berberine, obtained as above, to about sixteen parts of cold distilled water, and cautiously drop in, with constant stirring, solution of ammonia in slight excess, allow the mixture to stand in a cool place from twelve to twenty-four hours, then filter and surround the vessel containing the filtrate with ice, and stir sulphuric acid into the solution until the ammonia and alkaloid are saturated. In a few hours the magma of minute crystals of sulphate of berberine can be separated with a muslin strainer or a filtering paper. Care must be taken to avoid an excess of sulphuric acid. If this occur the moist magma should be removed to a vessel containing cold alcohol, washed by decantation, and drained on a muslin strainer. Finally, dry the salt by exposure to the atmosphere.

Sulphate of berberine is of an orange colour, soluble in about 100 parts of water at 60–70° F. It is readily decomposed by alkalies when in solution, yielding free berberine. It keeps well and is not affected by exposure to the air. Should it absorb moisture from the air, the salt may be regarded as impure, and containing either free sulphuric acid or hygroscopic extractive matter. One hundred pounds of hydrastis, treated as above, yields from eighteen to twenty-one ounces of the sulphate.

Berberine.—Rub eight parts of sulphate of berberine in a Wedgewood mortar, cautiously adding solution of ammonia until in slight excess. Pour the dark liquid into thirty-two parts of boiling alcohol and allow the mixture to stand for thirty minutes; then filter. Stir into the filtrate thirty-two parts of cold sulphuric ether and cover tightly. Surround the vessel with ice and allow it to stand from twelve to twenty-four hours, separate the magma of minute crystals of berberine with a muslin strainer or filtering paper, and dry by exposure to atmosphere.

Berberine is lemon-yellow when pure. An orange or brownish shade denotes impurity. It unites directly with acids, and is in every respect a decided base. It forms salts, some of which are very soluble, as, for example, the pyrophosphate; others are almost insoluble. The author finds it impossible to dissolve one part of carbazotate of berberine in forty-five thousand parts of cold distilled water.

Berberine and all its soluble salts are bitter. Owing to its ex-

treme insolubility, the carbazotate will not impart a trace of bitterness to distilled water, notwithstanding its constituents are both intensely bitter.

Berberine is soluble in about four and a half parts of water of 60–70° F. It dissolves moderately in alcohol, but is insoluble in ether and chloroform. It changes to orange colour when heated to 150° F., and slowly resumes its original shade when cooled.

Phosphate of Berberine.—Dissolve berberine in its weight of boiling water and add two parts of dilute phosphoric acid, drain and dry the precipitate by exposure to the atmosphere. Care should be taken that the acid used is made from phosphorus and perfectly free from nitric acid.

The orthophosphate is, according to Lord, soluble in 280 parts of water.

Hypophosphite of Berberine.—This salt may be prepared by substituting in the above formula hypophosphorus acid for phosphoric. Hypophosphite of berberine is soluble to the extent of from five to ten grains in an ounce of water.

Hydrochlorate of Berberine.—Dissolve berberine in sixteen times its weight of distilled water, and cautiously stir in hydrochloric acid until in slight excess; drain the precipitate and dry by exposure to the atmosphere.

Hydrochlorate of berberine was the first preparation of this alkaloid introduced to the medical profession. It was discovered accidentally. It is soluble in about 500 parts of water at 60–70° F., and almost insoluble in cold alcohol, ether, and chloroform. It is the most difficult of the berberine salts to decompose, holding its acid in the presence of alkalies, and even long digestion with litharge fails to thoroughly remove it. Oxide of silver at once liberates the berberine from a heated solution. When dry it is changed from the natural light lemon colour to orange by a heat of from 130–150° F. Upon cooling the lemon colour is restored. It is rapidly falling into disuse, giving place to the more soluble salts.

Nitrate of Berberine.—This salt can be obtained by substituting nitric acid for the hydrochloric acid of the preceding formula. It is of a greenish yellow colour, soluble in about 500 parts of water, more soluble in hot water, scarcely soluble in alcohol, ether, or chloroform. Its use is limited.

Nicotine and Nicotinic Acid. R. Laiblin. (*Liebig's Annalen*, cxvii., 129–182. From *Journ. Chem. Soc.*) The following modification of Schløesing's process for preparing nicotine is recom-

mended:—Coarsely-cut tobacco is digested for a day with cold water, and the mixture subsequently boiled by injection of superheated steam, filtered, and the residue pressed. The same series of operations is repeated, and the mixed filtrates are evaporated to one-third of their volume. A quantity of lime, one-tenth of the weight of the tobacco used, is now added, and the mixture distilled by a current of steam as long as nicotine (recognised by its odour) comes over. The distillate is exactly neutralized by oxalic acid—the amount used being noted—and evaporated to a thin syrup. The exact amount of potash necessary to neutralize the oxalic acid is now added, and the crude nicotine which separates is collected. The remaining liquid is exhausted with ether, and the nicotine thus extracted added to that first obtained. That portion of the crude base which distils over below 250° is converted into oxalate by adding powdered oxalic acid to its ethereal solution; and the purified oxalate, which separates as a syrup, after being washed with ether, is dissolved in water, and again decomposed with potash as above. The product is finally heated to 110° for six hours by a paraffin-bath, and a slow stream of dry hydrogen passed through it to remove ammonia, ether, and water. The temperature is then gradually raised to 210° to complete the removal of the water, and on fractionally distilling the residue, pure nicotine comes over between 240 – 242° . It must be preserved in sealed tubes. One cwt. of tobacco thus treated yielded 600 grams of pure nicotine ($= 1\frac{1}{2}$ per cent.), besides impure base.

Nicotine is not decomposed into well-defined simpler bodies by heating with hydrochloric acid at 280 – 300° . No addition-product is formed by the action of nascent hydrogen on the brominated hydrobromide, $C_{10}H_{13}N_2Br_5$.

Nicotine is readily oxidized by potassium permanganate in the cold, but only when the salt is added to its solution as long as it is decolorized is it possible to obtain crystalline oxidation products. By employing a suitable process, which is fully described, potassium carbonate and nicotinate are the sole products found. The nicotinate is dissolved out by absolute alcohol, and converted into silver salt by precipitation. Nicotinic acid may be obtained from this by decomposing it with hydrogen sulphide.

Nicotinic acid was first obtained by Huber, by oxidizing nicotine with chromic mixture, and was subsequently recognised by him as *carboxypyridenic acid*, $C_5H_4N.COOH$ (*Ber.* iii., 849). Weidel, also (*Annalen*, clxv., 328), by acting on nicotine with nitric acid, obtained an acid which he identified with Huber's, and which the

author, by a crystallographic comparison of salts, proves to be identical with his own; he, however, assigned to it the formula $C_{10}H_8N_2O_3$. By analyses of the acid, and a variety of its salts (silver, calcium, potassium) and other compounds with hydrochloric acid and auric and platinic chlorides, the author decides in favour of Huber's formula. He also shows that when nicotinic acid is distilled with soda-lime, it yields a quantity of pyridene nearly equal to that which might be expected from a carbopyridenic acid. Moreover, nicotine yields carbopyridedic acid in almost molecular proportions.

Nicotinic acid forms crystalline compounds with hydrochloric and hydrobromic acids of the formula $C_6H_5NO_2.HCl$ and $C_6H_5NO_2.HBr$.

Ethyl chlorocarbonate acts violently on pyridene, but does not form ethyl nicotinate; the only products are ethyl chloride, ethyl carbonate, and pyridene hydrochloride. Neither is ethyl nicotinate formed by acting with ethyl iodide on silver nicotinate. When the compound of nicotinic chloride with hydrochloric acid (see below) is treated with absolute alcohol, a violent action occurs, and the product, evaporated in a desiccator, deposits crystals of nicotinic acid hydrochloride. The mother-liquor from these crystals gives with caustic soda an oily liquid, probably containing the ether which no doubt existed in combination with hydrochloric acid.

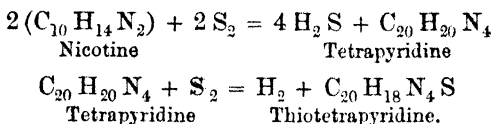
If nicotinic acid, or, better, potassium nicotinate, is treated with phosphorus pentachloride, energetic action ensues, and a volatile crystalline compound sublimes, the analysis of which corresponds approximately with the formula $C_5H_4N.COCl.HCl$. This chloride is insoluble in ether, chloroform, benzene, and petroleum-ether. When heated with water it is reconverted into nicotinic acid; but no amide could be formed from it by the action of ammonia.

When the double chloride of zinc and nicotine, $C_{10}H_{14}N_2.2HCl + ZnCl_2 + 4H_2O$, is distilled with soda-lime, a large quantity of gas is given off, containing ammonia, methylamine, free hydrogen, and traces of hydrocarbons. The liquid distillate consists principally of nicotine, but contains also a considerable quantity of pyrrol, which was separated by fractional distillation and analysed as the cadmium double salt. By carefully adding water to the fraction $245-270^\circ$, containing much nicotine, an oily liquid was separated, which, when dissolved in hydrochloric acid and fractionally precipitated by platinic chloride, gave a carmine-red easily-decomposable double salt, $(C_{10}H_{11}N.HCl)_2.PtCl_4$. The free base is a yellowish liquid of extremely penetrating and repulsive odour, boiling

between 250–270°. The smallest quantity of it, dissolved in hydrochloric acid, gives an intensely red solution when boiled with platinic chloride. It is probably formed from nicotine by the direct separation of ammonia, $C_{10}H_{14}N_2 - NH_3 = C_{10}H_{11}N$.

A New Nicotine Derivative. A. Cahours and A. Etard. (*Comptes Rendus*, lxxxviii., 999.) The authors obtained a peculiar derivation of nicotine by heating 100 parts of this alkaloid with 20 parts of sulphur at 140° C. Sulphuretted hydrogen was evolved during the reaction, and a dark green fluid left, from which in the course of a few days numerous yellow prismatic crystals separated. These, after being purified by repeated recrystallization from boiling alcohol, were found to be neutral to test paper, fusible at 155° C., readily soluble in hot alcohol, slightly soluble in cold alcohol and in benzol, and almost insoluble in ether. Their composition is represented by the formula $C_{20}H_{18}N_4S$. Strong heat splits them up into sulphuretted hydrogen, carbon, and a volatile oil.

The authors regard this body as *thiotetrapyridine*, and explain its formation by the following equations:—



They also describe a crystallizable hydrochloride of this body having the composition $C_{20}H_{18}N_4S \cdot 2HCl$.

Existence of a Poisonous Alkaloid differing from Nicotine in the Smoke of Tobacco. G. Le Bon and G. Noel. (*Compt. Rend.*, June 28, 1880.) The author has detected in the smoke of tobacco hydrocyanic acid, various aromatic principles, and a highly toxic alkaloid of a pleasant odour, which he believes to be identical with collidine.

Formation of Poisonous Alkaloids in the Human Corpse. Prof. Selmi. (*Gaz. Chim. Ital.*, ix., 35–37. From *Journ. Chem. Soc.*) As is well known, substances having the general reactions of the vegetable alkaloids may be extracted from the corpse, some of which are innoxious and others poisonous. The identification of these alkaloidal substances or *ptomaines* is of great interest to toxicologists, as it is possible they may be confounded with alkaloids that have been used for the purpose of poisoning.

As it seemed probable that these alkaloids were produced by the slow putrefaction of proteid matters, the author enclosed the whites of 60 eggs in a retort, and allowed them to decompose slowly. The product was treated with alcohol, and from the

alcoholic solution two basic substances were obtained, one volatile and the other not. The volatile base has an alkaline reaction and a peculiar odour. It forms a crystalline and deliquescent hydrochloride, which gives a turbidity with tannin, and a precipitate with iodized hydriodic acid and with platinum tetrachloride. Gold chloride produces a yellowish crystalline precipitate in solutions of the sulphate. It had no poisonous action on the frog. The non-volatile alkaloid yields a hydrochloride crystallizing in needles, which rapidly undergo change, especially on concentrating the solution. It has a pungent taste, and is poisonous. It gives the general reactions of the alkaloids, and with iodized hydrochloric acid a compound crystallizing in long brown needles.

The discovery of a poisonous alkaloid, soluble in ether, amongst the products of the putrefaction of albumen, indicates the way in which the poisonous ptomaines are formed, and affords a method of obtaining them in quantity sufficient to study their properties. The author is in hopes, by a careful investigation of the other compounds formed during the slow putrefaction of albumin, to obtain a better insight into the constitution of the proteids than would be possible by treating them with powerful reagents, such as sulphuric acid, baryta, etc. It is, moreover, not impossible that these poisonous alkaloids, produced by putrefaction, may also be formed in the animal economy when a more or less profound alteration occurs in some of the organs, in the blood, or in the other humours.

Emetine. M. Podwissotzki. (*Pharm. Zeitschr. für Russland*, 1880, No. 1.) Commercial emetine is very impure. As a convenient method of preparing this alkaloid in a perfectly pure state, the author recommends the following:—Powdered ipecacuanha is freed from fat, wax, etc., by extraction with ether, and then heated to remove the adhering ether. It is next exhausted with hot alcohol of 85 per cent., the tincture evaporated to the consistence of a syrup, the residue mixed with a strong solution of ferric chloride (containing a quantity of Fe_2Cl_6 amounting to 10–13 per cent. of the root used), and then with a sufficient quantity of powdered sodium carbonate to produce a strong alkaline reaction. The magma thus obtained is treated with hot petroleum ether, which dissolves the emetine, and separates it on cooling in the form of white flakes. A further quantity is obtained by evaporating the petroleum ether, but this second product is not perfectly white. Ipecacuanha yields $\frac{3}{4}$ –1 per cent. of pure alkaloid.

Emetine thus prepared is readily soluble in cold ether, chloroform, alcohol, essential and fatty oils, but difficultly soluble in petroleum

ether. It is bitter and strongly alkaline, and changes to yellow on prolonged exposure to air and light. With acids it forms uncrystallizable salts which are easily soluble in water, alcohol, and fixed oils, but insoluble in ether and petroleum ether. Tannate of emetine is very insoluble in water. Concentrated sulphuric acid decomposes emetine slowly with the formation of oxalic acid. A solution of sodium phosphomolybdate in concentrated sulphuric acid colours it brown, and on the subsequent addition of a little more sulphuric acid the brown colour changes to a deep indigo-blue.

Picrotoxin. E. Paternò and A. Ogliarolo. (*Gaz. Chem. Ital.*, ix., 57-64. *From. Journ. Chem. Soc.*) In former papers the authors described picrotoxide, $C_{15}H_{16}O_6$, and hydrate of picrotoxide $C_{15}H_{18}O_7$, obtained by the action of hydrochloric acid on picrotoxin suspended in ether, and also a substance, $C_{15}H_{15}BrO_6$, regarded as monobromopicrotoxide, formed by the action of bromine on the hydrate of picrotoxide. This hydrate can be easily prepared by saturating a boiling alcoholic solution of picrotoxin with dry hydrochloric acid, and distilling off the alcohol: the residue is then dissolved in water and agitated with ether, which on evaporation leaves the hydrate of picrotoxide in the crystalline state. It may be purified by recrystallization from boiling water. In their last paper the authors stated that by the action of acetic chloride on the hydrate of picrotoxide they had obtained a crystalline compound, which they believed to be a diacetyl derivative, $C_{15}H_{16}O_7\bar{A}c_2$. As, however, the results of the elementary analysis cannot afford any definite evidence as to whether it was a monacetyl or diacetyl derivative, the percentage of carbon in the two formulæ differing by 0.09 only—the benzoyl derivative was prepared by the action of benzoic chloride on the hydrate of picrotoxide. It crystallizes in colourless prisms (m. p. about 230°), which on analysis were found to have the composition indicated by the formula $C_{15}H_{17}O_7\bar{B}z$. It is almost certain, therefore, that the acetyl-compound has a similar composition, $C_{15}H_{17}O_7\bar{A}c$.

By the action of acetic anhydride and sodium acetate on picrotoxin, two crystalline substances are produced, one of which (m. p. 227°) is formed only in very small quantity; the other, after being purified by crystallization from boiling alcohol, is obtained in large colourless prisms (m. p. 245°), sparingly soluble in ether, but easily in chloroform. When boiled with potash, or even when heated with water at 150° , it is decomposed with elimination of acetic acid; this circumstance and the analytical results show that it is an acetyl-compound of the formula $C_{19}H_{20}O_8$. By the action of bromine a

compound is produced, crystallizing in prisms (m. p. 180°), which are soluble in alcohol, ether, and chloroform; but whether this is a dibromo-derivative, $C_{19}H_{18}Br_2O_8$, or an addition-product, $C_{19}H_{20}O_8Br_2$, could not be ascertained by analysis. As, however, but little hydrobromic acid was evolved during the reaction, and the melting point of the derivative is lower than that of the parent compound, it is probably an addition-product. The results obtained by the action of hydrobromic acid were unsatisfactory; a crystalline substance containing bromine is formed, which melts at about 150° , but the analytical numbers did not correspond with the formula $C_{19}H_{20}O_8HBr$.

With regard to the chief product of the action of acetic anhydride and sodium acetate on picrotoxin, the authors are inclined to believe that it is an unsaturated compound, but a derivative of picrotoxide.

Characteristic Reactions of Picrotoxin and some of its Derivatives.

A. Ogliastro. (*Gaz. Chem. Ital.*, ix., 113-118. From *Journ. Chem. Soc.*) The close resemblance between the physical properties of picrotoxin and those of hydrate of picrotoxide induced the author to compare the reactions of the two substances, and also to examine the behaviour of bromopicrotoxide with different reagents. After noticing the known reactions of picrotoxin, the comparative experiments made with picrotoxin and its derivatives are described in detail.

Reaction with Nitric Acid and Potash.—When a small quantity of nitric acid is added to picrotoxin, and the mixture carefully evaporated to dryness, a yellowish red amorphous residue is obtained, which slowly dissolves in potash with a bright red colour. Hydrate of picrotoxide treated in the same manner with nitric acid yields a crystalline residue, which dissolves in potash with a brilliant red colour; this, however, disappears rapidly, leaving the solution colourless. If the liquid is evaporated to dryness, acidified with hydrochloric acid, and ferric chloride added, it becomes of a bright yellow. Bromopicrotoxide gives a yellow and not a red coloration with nitric acid and potash.

Reaction with Picric Acid.—On mixing a 2 per cent. solution of picric acid with potash, and heating, an orange-coloured solution is obtained which deposits crystals of the potassium compound on cooling. If, however, picrotoxin or hydrate of picrotoxide, be added to the solution, the colour is very much deeper, and on cooling no crystals are deposited. The presence of bromopicrotoxide produces none of these effects.

Reaction with Fehling's Solution.—On dissolving picrotoxin or hydrate of picrotoxin in dilute potash, adding a few drops of Fehling's test, and heating, reduction takes place. Bromopicrotoxin has no action.

Reaction with Chromic Mixture.—When a few drops of concentrated sulphuric acid are poured on to picrotoxin or hydrate of picrotoxin, it dissolves with a yellow colour, passing into saffron-yellow: the addition of a small quantity of potassium bichromate in powder changes this to greenish violet, which on diluting with water passes into greenish yellow. Bromopicrotoxin dissolves in sulphuric acid, yielding a colourless solution which becomes yellow on adding potassium bichromate.

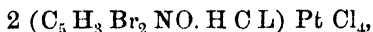
Reaction with Potash.—Both picrotoxin and hydrate of picrotoxin, when added, even in minute quantity, to potash solution, colour it yellow, but this coloration soon disappears. If the solution be now heated on a water-bath, the coloration is reproduced, becomes yellowish red, and then bright brick-red, and finally, if heated over the bare flame, it acquires a brown tint. Bromopicrotoxin gives no reaction with potash in the cold; but on heating, colour-changes occur similar to those just mentioned.

Reaction with Copper Acetate.—When picrotoxin or hydrate of picrotoxin is carefully heated to boiling with a dilute solution of copper acetate, a turbidity is produced and a black pellicle is formed, the liquid becoming colourless. Bromopicrotoxin likewise produces the black deposit, but the liquid does not become decolorized.

Neither picrotoxin nor hydrate of picrotoxin gives any reaction with gold, platinum, or mercury chloride, or with tincture of iodine, or with tannic acid.

Piperidine and Pyridine. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xii, 984-990. *Piperidine*, $C_5H_{11}N$, is not decomposed by fuming hydrochloric acid at 300° . The hydrochloride combines directly with bromine to form a crystalline addition-product, which rapidly decomposes even at the ordinary temperature. On heating this bromine compound, or a mixture of bromine and piperidine hydrochloride in sealed tubes at 200° , hydrobromic acid and a small quantity of bromoform are produced, and on the addition of water to the contents of the tubes, a substance having the composition $C_5H_3Br_2NO$ separates out in crystalline plates. The crystals are almost insoluble in cold water and ether; they dissolve in ammonia or soda solution, but are reprecipitated by dilute acids. They are decomposed by heat without melting. When platinic chloride is

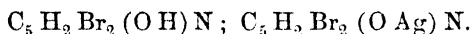
added to a solution of this substance in strong hydrochloric acid, the platinum double salt,—



is deposited in long needles, which are decomposed by water.

The *silver* salt, $\text{C}_5 \text{H}_2 \text{AgBr}_2 \text{NO}$, is a sparingly soluble crystalline powder, and the *methyl* salt, $\text{C}_5 \text{H}_2 (\text{CH}_3) \text{Br}_2 \text{NO}$, crystallizes in white needles, which melt at 192° .

The existence of the above compounds seems to indicate the presence of a hydroxyl group in the piperidine derivative, *e.g.*,



Pyridine.—When bromine is added to a solution of pyridine hydrochloride, a crystalline orange-coloured substance is precipitated. On heating this precipitate, or a mixture of bromine and pyridine hydrochloride at 200° , *dibromopyridine*, $\text{C}_5 \text{H}_3 \text{Br}_2 \text{N}$, separates out in needle-shaped crystals, soluble in ether and in strong hydrochloric acid. It is precipitated from the acid solution by water. Dibromopyridine melts at 109° , but begins to sublime at 100° . It forms a double salt with platinic chloride, which crystallizes in large rhombic plates. Baryta water, ammonia, alcoholic potash, nitric acid, sulphuric acid, and potassium permanganate have no action on dibromopyridine.

Monobromopyridine (b. p. 170°) appears to be formed at the same time as the dibromopyridine.

The alleged Identity of Columbin and Limonin. E. Paternò and A. Ogliastro. (*Gaz. Chim. Ital.*, ix., 64–67. From *Journ. Chem. Soc.*) Schmidt (*Annalen*, xli., 338) considered that limonin was identical with the columbin extracted from columbo root by Wittstock (*Ibid.*, xix. 298); and as the authors found much difficulty in preparing limonin in quantity from the seeds of the lemon and orange, whilst columbin could be obtained with comparative ease, they determined to examine into the question of the supposed identity of the two substances. The yield of limonin is but small, only 80 grams of the impure substance having been obtained from 15,000 grams of the seeds. It crystallizes in beautiful lustrous plates, and has the characters ascribed to it by Schmidt, except that it melts at 275° and not at 244° ; moreover, it not only dissolves in potash without alteration, but also in baryta water, forming a kind of salt which is not decomposed by carbonic anhydride. The formula which agrees best with the analytical results is $\text{C}_{26} \text{H}_{30} \text{O}_3$; this requires C = 66.38; H = 6.38.

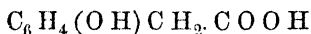
When columbo root is extracted with ether and the solution is evaporated, a crystalline residue is obtained which, after being washed with a little cold ether to remove fatty matters, etc., is treated with boiling alcohol; on cooling, the solution deposits colourless prismatic crystals, which melt at 182° , and have all the properties of Wittstock's columbin. The results of the elementary analysis agree with the formula $C_{21}H_{22}O_7$, which requires $C = 65.28$; $H = 5.69$.

When the residue which is left after the separation of the columbin, and is almost insoluble in alcohol, is crystallized from boiling glacial acetic acid, it yields a second substance, having a melting point of 218° – 220° . Both this compound and Wittstock's columbin are therefore quite distinct from limonin.

Scillain. E. v. Jarmersted. (*Ber. der deutsch. chem. Ges.*, xii., 1165.) Scillain is a glucoside isolated from *Urginea Scilla*. It is an amorphous white powder almost insoluble in water but readily soluble in alcohol, and strongly poisonous. A dose of 1 to 2 milligrams is fatal to small animals.

The Glucoside from White Mustard Seed. H. Will and A. Laubenheimer. (*Liebig's Annalen*, cxci., 150–164. From *Journ. Chem. Soc.*) Sinalbin, $C_{30}H_{44}N_2S_2O_{16}$, is prepared by extracting with warm alcohol white mustard seed (*Sinapis alba*) from which the oil has been removed by pressure and by treatment with carbon bisulphide. The crystals which are deposited are washed with carbon bisulphide and dissolved in a small quantity of hot water; the solution is then boiled with animal charcoal, filtered, and mixed with strong alcohol, and the precipitate which is formed is recrystallized from alcohol, when pale yellow needle-shaped crystals of sinalbin are obtained. The mother-liquor from the crude sinalbin contains sinapin thiocyanate. Sinalbin is insoluble in ether and carbon bisulphide, sparingly soluble in cold absolute alcohol, but freely soluble in water. The aqueous solution has a neutral reaction; when brought in contact with a trace of an alkali it acquires an intense yellow colour, which is turned red by nitric acid. Silver nitrate throws down a white precipitate, which consists of the silver compounds of sinapin and sinalbin thio-carbimide; the filtrate, which has a strongly acid reaction, contains sinapin (which may be precipitated by mercuric chloride) and grape sugar. When the precipitate is decomposed by sulphuretted hydrogen, sinapin sulphate, $C_{16}H_{24}N_2O_6H_2SO_4$, and the cyanide, $C_6H_4(OH)CH_2CN$, pass into solution; the latter can be extracted with ether. After recrystallization from benzene the cyanide forms colourless plates

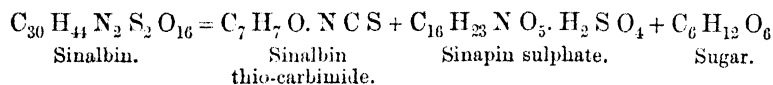
(m. p. 69°) soluble in ether, alcohol, warm benzene, and warm water. On boiling with potash, ammonia is evolved and orthohydroxyphenylacetic acid,



is produced. The acid crystallizes in colourless prisms (m. p. 144.5°), soluble in alcohol, ether, and hot water, and bears some resemblance to Salkowski's parahydroxyphenylacetic acid (*Ber.*, xii. 1438). The calcium salt, $(\text{C}_6\text{H}_7\text{O}_3)_2\text{Ca} + 4\text{H}_2\text{O}$, forms glistening prisms, sparingly soluble in cold water; the barium salt, $(\text{C}_6\text{H}_7\text{O}_3)_2\text{Ba} + \text{H}_2\text{O}$, triclinic prisms, slightly soluble in cold water. The silver salt, $\text{C}_6\text{H}_7\text{O}_3\text{Ag}$, is almost insoluble in water, and is decomposed by heat.

On the addition of mercuric chloride to a warm aqueous solution of sinalbin, a precipitate is produced which contains, in addition to compounds of mercury with sinapin sulphate and the cyanide, $\text{C}_7\text{H}_7\text{O} \cdot \text{CN}$, a double chloride, viz., $\text{C}_{16}\text{H}_{23}\text{N O}_5 \cdot \text{H Cl} \cdot \text{Hg Cl}_2$.

If ground white mustard seed is treated with water and filtered, an acid liquor is obtained which contains myrosin, sugar, sinapin thiocyanate, and sulphate. The myrosin may be precipitated from this solution by alcohol. An aqueous solution of sinalbin is decomposed by myrosin, thus:—



The pungent principle in the mustard seed is contained in the albuminous precipitate, which separates out on the addition of the myrosin; by extraction with alcohol and ether it can be obtained in the impure state as a yellow oil insoluble in water.

The Glucoside of Liquorice. F. Sestini. (*Gaz. Chim. Ital.*, viii., 454-462. From *Journ. Chem. Soc.*) An aqueous extract of the root, on being evaporated to dryness after treatment with animal charcoal, yields a product from which absolute alcohol extracts asparagine. The residue dissolves in dilute spirit, and when burnt leaves an ash containing lime, alkalies, and a trace of sulphuric acid. From these results it is evident that glycyrrhizin does not exist in the root in the free state, but in combination with bases, chiefly lime. An examination of the commercial extract or "liquorice," shows that it contains free glycyrrhizin in small quantity, liberated, apparently, from its combinations by the acids formed during the evaporation of the juice. Roussin (*Journ. Pharm.*, 1875) imagined that the glycyrrhizin existed in the root as an ammonium compound con-

taining 0.14 per cent. nitrogen ; but, as the author points out, the method by which he obtained this compound (precipitating the glucoside with sulphuric acid, and treating it first with alcohol and ether, and then with an alcoholic solution of ammonia), affords no evidence that it existed in the root as such ; and moreover, it is not very probable that the substance obtained by Roussin is a definite compound, as it would contain 26 or 27 molecules of glycyrrhizin to one of ammonia.

The glucoside dissolves in dilute potash solution, and is precipitated again unaltered by acids, but the potassium compound formed could not be isolated. Better success attended the attempts to prepare the calcium and barium compounds. *Calcium glycyrrhizate*, prepared by adding calcium chloride to a solution of the glucoside in the smallest excess of potash, washing the precipitate with water, and drying at 100° , forms a brown shining mass. By dissolving glycyrrhizin in milk of lime, filtering, separating the excess of lime by carbonic acid, and evaporating, a residue is obtained, which when treated with alcohol of 50 per cent. and evaporated yields the glycyrrhizate in amorphous yellowish scales. This glycyrrhizate is hygroscopic and has a sweet taste ; it is almost insoluble in dry alcohol, but dissolves tolerably well in dilute alcohol.

It is only sparingly soluble in water, but more readily in presence of calcium hydrate, which points to the existence of a basic compound.

Dried at 110° and analysed it gave numbers corresponding with the formula $3 \text{ Ca O} + 5 \text{ C}_{24} \text{ H}_{36} \text{ O}_9$, adopting Gorup-Besanez's formula, $\text{C}_{24} \text{ H}_{36} \text{ O}_9$, for glycyrrhizin.

Barium glycyrrhizate, $3 \text{ Ba O} + 5 \text{ C}_{24} \text{ H}_{36} \text{ O}_9$, obtained in a manner similar to the calcium compound, by dissolving glycyrrhizin in baryta water, passing carbonic anhydride, and evaporating, forms yellowish scales. All the compounds of glycyrrhizin with bases have a sweet taste ; glycyrrhizin itself, when first placed on the tongue is insipid, but as it dissolves in the alkaline saliva it acquires a sweet taste.

The ordinary method of preparing glycyrrhizin by exhausting the root with water and precipitating with sulphuric acid, gives very unsatisfactory results, as the product is small and highly coloured, and there is great difficulty in separating the adherent sulphuric acid. The author prefers to exhaust the root four or five times successively with boiling water and a little milk of lime, and to precipitate the concentrated extract with acetic acid. The brownish gelatinous precipitate, after being washed with water, is dissolved in

spirit of 50 per cent., decolorized by animal charcoal, and evaporated on the water-bath until the alcohol is expelled. On cooling it solidifies to a gelatinous mass, which is dissolved in alcohol, mixed with twice its volume of ether, filtered, and evaporated. The gelatinous glycyrrhizin is then pressed and dried over sulphuric acid. The author regards the crystalline substance obtained by Habermann (*Wien. Akad. Ber.*, lxxiv. 2) as an alteration product.

In order to determine the amount of glycyrrhizin in the root, it is extracted eight times successively with boiling water rendered alkaline by calcium hydrate, and the solution concentrated to a syrup is precipitated with 10 per cent. acetic acid, which has been previously saturated with glycyrrhizin, as is also the dilute acid (2 per cent.), and water used for washing. The precipitated glycyrrhizin is then dissolved in alcohol and the solution evaporated after treatment with animal charcoal. In this way the fresh root, containing 48 per cent. water, yields 3.271 per cent. glycyrrhizin, or 6.318 on the dry root.

Glycyrrhizin. J. Habermann. (*Liebig's Annalen*, cxvii., 105.) The ammoniacal glycyrrhizin of commerce, when dissolved in boiling glacial acetic acid yields upon cooling acid glycyrrhizate of ammonium, $(\text{N H}_4) \text{C}_{44} \text{H}_{62} \text{N O}_{18}$, which may be purified by recrystallization from boiling alcohol. It forms transparent shining scales, soluble in hot water and insoluble in ether. The solution produces precipitates with acetate of lead, nitrate of silver, and other salts of the heavy metals.

Glycyrrhizic acid is prepared from the lead salt by decomposition with sulphuretted hydrogen. It is an amorphous tribasic acid, soluble in hot water, in boiling glacial acetic acid, and in hot diluted alcohol, and forms a jelly with cold water. It reduces Fehling's solution.

The neutral and acid glycyrrhizates of ammonium and potassium have an intensely sweet taste. The neutral ammonium salt, $(\text{N H}_4)_3 \text{C}_{44} \text{H}_{62} \text{N O}_{18}$, is a clear brown amorphous mass, easily soluble in water and weak alcohol, but insoluble in absolute alcohol. The neutral potassium salt, $\text{K}_3 \text{C}_{44} \text{H}_{62} \text{N O}_{18}$, forms a yellowish white resinous mass, insoluble in ether and absolute alcohol. Acid potassium glycyrrhizate, $\text{K C}_{44} \text{H}_{62} \text{N O}_{18}$, forms minute colourless crystals, and is obtained by cooling a solution of the neutral salt in hot acetic acid.

Simple Mode of Preparing a Solution of the Double Iodide of Bismuth and Potassium for Use as an Alkaloidal Reagent. J. C. Thresh. (*Pharm. Journ.*, 3rd series, x., 641.) This delicate reagent for alkaloids can be conveniently prepared as follows:—

Liq. Bismuthi, B. P.	3j.
Pot. Iodid.	ʒiiss.
Acid. Hydrochlor.	ʒiiss.
Mix.	

The resulting fluid is of a rich orange colour, and when added to cold solutions containing an alkaloid produces immediately an orange-red precipitate, which appears to be almost totally insoluble in cold water, though somewhat readily soluble in hot water. In point of delicacy, it is at least equal to the solution of phosphomolybdic acid, which is both troublesome and difficult to properly prepare. One part of strychnine may be detected in 500,000 parts of water, and one of morphine in 20,000. All the other alkaloids examined fall between these extremes.

Volumetric Determination of Alkaloids by Solution of the Iodides of Bismuth and Potassium. J. C. Thresh. (*Pharm. Journ.*, 3rd series, x., 809.) The author records the results of very numerous experiments, with the intention of showing that the solution of the double iodide of bismuth and potassium may be usefully employed for the volumetric estimation of alkaloids. As the experiments have as yet not led up to a method of general applicability, we must confine ourselves to this notice and refer the reader to the original article.

A Method for the Proximate Analysis of Plants. H. B. Parsons. (*Amer. Chem. Journ.*, i., No. 6.)

I. Preparation of Sample.

The air-dried specimen should be carefully examined, and all extraneous substances removed. The entire sample should then be ground, or beaten in an iron mortar, until it will all pass through a sieve having from forty to sixty meshes to the linear inch. After thoroughly mixing this sample, take of it 100 grams, which should be further pulverized until it will all pass through a sieve having eighty to one hundred meshes to the linear inch. From this smaller portion remove all iron, derived from mill or mortar, by use of a magnet. Then place in a clean dry bottle, which should be labelled and securely corked. This small sample is for the analysis; the larger portion should be reserved for the separation of those proximate principles which seem, from the analysis, to be worthy of more extended investigation.

II. Estimation of Moisture.

Dry rapidly, at 100° to 120° C., 2 or more grams of the sample; the loss of weight equals moisture, and occasionally a little volatile

oil. In some cases it is best to dry at a lower temperature, and at other times the drying should be conducted in a stream of hydrogen or carbonic anhydride.

III. *Estimation of Ash.*

In a weighed crucible gently ignite two or more grams of the sample until nearly or quite free from carbonaceous matter; the heat should not be permitted to rise above faint redness, or loss of alkaline chlorides may occur. Weigh this residue as crude ash, and in it determine—

(a) *Amount Soluble in Water.*—This portion may contain chlorides sulphates, phosphates, and carbonates of potassium and sodium, also slight amounts of chlorides and sulphates of calcium and magnesium.

(b) *Insoluble in Water; Soluble in Dilute Hydrochloric Acid.*—The residue from (a) should be treated with a slight excess of hydrochloric acid, and evaporated in a porcelain dish over a water-bath until all free acid has been expelled; it should then be again moistened with hydrochloric acid, water added, and be filtered from any remaining insoluble substances. This treatment removes carbonates (with decomposition) and phosphates of calcium and magnesium, sulphate of calcium, and oxides of iron and manganese.

(c) *Insoluble in Water; Insoluble in Dilute Hydrochloric Acid; Soluble in Concentrated Sodid Hydrate.*—Boil the residue from (b) with a solution containing about 20 per cent. of sodid hydrate. This treatment removes combined silica of the ash. The residue still insoluble is sand and clay, which adhered to the specimen; this residue should be separated, washed thoroughly, and weighed.

Always determine the amounts removed by the above treatment by weighing the dried, undissolved residues. The ash, as thus estimated, usually includes a little unconsumed carbon, together with more or less carbonic anhydride (CO_2), most or all of which was not originally present in the plant, but was produced by the combustion of the organic matter. For most purposes it is unnecessary to estimate and exclude from the ash this carbonic anhydride; where great accuracy is desired, a complete quantitative analysis should be made, the amount of each base and acid being determined, and in the statement of results only those should be included which existed originally in the plant. For this purpose it is necessary to burn from 20 to 100 grams of the sample; for further directions consult text-books on agricultural and inorganic analysis.

IV. Estimation of Total Nitrogen.

In half a gram or more of the sample determine total nitrogen by combustion with excess of soda-lime, as directed by Professor S. W. Johnson and E. H. Jenkins. If later in the analysis no other nitrogenous substances are discovered, calculate the total amount of nitrogen to albuminoids by multiplying by 6.25. When other nitrogenous compounds are present, their contents of nitrogen should be determined directly or by difference; after proper deductions have been made, the remaining nitrogen should be calculated to albuminoids.

V. Estimation of Benzol Extract.

In a suitable apparatus for repercolation completely exhaust 5 grams of the sample with pure coal-tar benzol (sp. gr. .85-.88, boils at 80-85° C., leaves no residue when evaporated). The extraction requires from four to six hours continued action of the solvent. Carefully evaporate this liquid to dryness in a weighed dish, and record its weight as total benzol extract. This extract may contain volatile oils and other aromatic compounds, resins, camphors, volatile or non-volatile organic acids, wax, solid fats, fixed oils, chlorophyll, other colours, volatile or fixed alkaloids, glucosides, almost no ash.

To the weighed extract add water, again evaporate on the water-bath, and complete the drying in an air-bath at 110° C. In the absence of other vaporizable substances, the loss of weight approximates the amount of volatile oil. If the presence of a volatile alkaloid is suspected (from a characteristic odour or an alkaline reaction), add a drop of hydrochloric acid to prevent its volatilization. Camphors are partially dissipated by this treatment; hence, when they are present, this evaporation should be dispensed with.

Now I treat the residue with a moderate amount of warm water, all to stand until cool, then filter through fine paper by aid of a Bunsen's pump. In half of the aqueous filtrate determine total organic matter and ash; test the remaining half for alkaloids, glucosides, and organic acids by salts of lead, silver, barium, and calcium. Care must be taken not to mistake a slight amount of suspended matter, frequently resinous, for other substances actually soluble in water.

The still undissolved residue should be again removed from filters and dishes by solution in benzol, the benzol solution being again evaporated to dryness. Treat this residue with warm, very dilute hydrochloric acid, allow to cool and filter through paper.

The filtrate should be tested for alkaloids and glucosides. The amount extracted by acid, if any, may be determined by weighing the still undissolved residue. Treat this residue with several considerable portions of 80 per cent. alcohol (sp. gr. .8483 at 15.6° C.), allowing at least an hour for each treatment. Filter through paper and determine by evaporation the matter dissolved; this usually consists of chlorophyll, with one or more resins, which may sometimes be separated by use of petroleum, naphtha, chloroform, or similar solvents. Purified animal charcoal removes chlorophyll and some resins from alcoholic solution, while certain other resins are not removed. If camphors were present in the plant, the greater portion will be found in the alcoholic liquid.

The substances undissolved by 80 per cent. alcohol may be fixed oil, solid fat, wax, and very rarely a resin; their separation may be attempted by refrigeration and pressure, or by use of ether, chloroform, etc.

Recapitulation.

1. Loss by evaporation, with precautions : *volatile oil.*
2. Soluble in water : *alkaloids, glucosides, organic acids.*
3. { Insoluble in water.
Soluble in dilute acids. } : *Alkaloids, possibly glucosides.*
4. Insoluble in water. a. { Removed by animal charcoal : *chlorophyll, some resins.*
4. Insoluble in dilute acids. : { Not removed by animal charcoal : *some resins.*
- Soluble in 80 per cent. alcohol. b. {
5. { Insoluble in water.
Insoluble in dilute acids.
Insoluble in 80 per cent. alcohol. } : *wax, fats, fixed oils.*

It is frequently advantageous to extract the plant with petroleum naphtha (sp. gr. .66-.70, boils at about 50° C., wholly volatile) before treatment with benzol; by reference to the accompanying table of comparative solubilities, it will be seen that this treatment may serve to separate fixed and volatile oils and some resins and colours from certain solid fats, wax, and other resins and colours.

Where benzol of sufficient purity cannot be had, pure chloroform is the best substitute. The use of ether is objectionable in this place, as its solvent properties are less distinctly marked than are those of naphtha, chloroform, and benzol; in other words, more plant constituents are sparingly soluble in ether than in the above mentioned

solvents. Consequently, many substances which should properly be extracted by 80 per cent. alcohol, would be sparingly dissolved if ether were used, while benzol, chloroform, and naphtha would have no perceptible solvent action upon them; tannic acids may be cited as instances illustrating this point.

VI. *Estimation of Eighty per cent. Alcohol Extract.*

That part of the plant not dissolved by benzol should be dried at 100° C. and then completely exhausted by eighty per cent. alcohol (sp. gr. .8483 at 15.6° C.). This requires from twelve to fourteen hours' continuous treatment with the solvent. Remove, dry, and weigh any crystals or powder that may separate upon concentrating and cooling the alcoholic percolate. Make the clear liquid to a definite volume by adding more eighty per cent. alcohol. In a measured part of this liquid determine the *total organic matter and ash*: in another equal portion determine the *total organic matter and ash soluble in water*, and, by difference, the *total organic matter insoluble in water*.

The remaining clear alcoholic liquid should be evaporated carefully to dryness, pulverized, and treated with several considerable portions of absolute alcohol (sp. gr. .7938 at 15.6° C.).

A. SOLUBLE IN ABSOLUTE ALCOHOL.

a. *Soluble in water.*

a¹. *Precipitated by subacetate of lead.*

Tannin and most organic acids; some extractives; some inorganic acids of the ash. Weigh in Gooch's filter, ignite cautiously, and again weigh; loss equals organic matter precipitated.

a². *Not precipitated by subacetate of lead.*

Alkaloids, glucosides, some extractives and colours.

Determine by difference between *a* and *a*¹.

b. *Insoluble in water.*

b¹. *Soluble in dilute hydrochloric acid.*

Alkaloids, glucosides (rarely), some extractives.

Determine by difference between *b* and *b*².

b². *Insoluble in dilute hydrochloric acid.*

b³. *Soluble in dilute ammoniac hydrate.*

Most acid resins, some colours. Determine by difference between *b*² and *b*⁴.

b⁴. *Insoluble in dilute ammoniac hydrate.*

Neutral resins, some colours, albuminoids (in some seeds).

Redissolve in alcohol, evaporate and weigh.

TABLE OF COMPARATIVE SOLUBILITIES.

Substances.	Water.	* Ab. Al- cohol.	50 per cent. Alco- hol.	Ab. Ether.	Chlo- roform.	Ben- zol.	Pet. Naph.	10 per cent. Am- monia.	Am- monic Cupric Oxide.	H ₂ SO ₄ , H ₂ O, Sp. gr. 1.78.	Fehling's Sol.	Lead Sub- acetate.
Volatile oils	Sp.	Sol.	Sol.	Sol.	Sol.	Sol.	Sol.	Sol.	...	...	...	...
Fixed oils	Ins.	Ins.?	Ins.	Sol.	Sol.	Sol.	Sol.	Sol.	...	...	...	...
Wax	Ins.	Sp.	Sp.	Sp.	Sp.	Sol.	Sp.?	Ins.?	...	...	...	...
Solid Fats	Ins.	Sp.	Sp.	Sp.	Sp.?	Sol.	Sp.?	Ins.?	...	...	...	...
Chlorophyll.	Ins.	Sol.	Sol.	Sol.	Sol.	Sol.	Sol.	Ins.	...	...	...	...
Soft resins	Ins.	Sol.	Sol.	Sol.	Sol.	Sol.	Sol.	Ins.	...	...	...	...
Hard resins.	Ins.	Sol.?	Sol.	Sol.?	Sol.	Sol.	Sol.	Ins.?	...	...	...	...
Glucose	Sol.	Ins.	Sp.	Ins.	Ins.	Ins.	Ins.	Sol.	...	...	Reduced	Not prec.
Sucrose	Sol.	Ins.	Sp.	Ins.	Ins.	Ins.	Ins.	Sol.	...	...	Not Reduced +	Not prec.
Tannin	Sol.	Sol.	Sol.	Sp.	Ins.	Ins.	Ins.	Sol.	...	...	Reduced	Not prec.
Glucosides	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	...	...	Reduced +	Not prec.
Alkaloids	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	Sol.?	...	...	Reduced	Not prec.
Albuminoids	Sol.?	Sol.?	Sol.?	Sol.?	Ins.	Ins.	Ins.	Ins.?	...	...	...	Not prec.
Gums.	Sol.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.?	...	...	Not Reduced	Not prec.
Pectin	Sol.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Sol.?	...	...	...	Not prec.
Pectic acid	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Sol.?	...	...	...	Not prec.
Organic acids	Sol.?	Sol.?	Sol.	Ins.?	Ins.?	Ins.?	Ins.?	Sol.	...	...	...	Not prec.
Salts of org. acid	Sol.?	Sol.?	Sol.?	Ins.?	Ins.?	Ins.?	Ins.?	Sol.?	...	...	...	Not prec.
Starch	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Sol.?	...	...	...	Not prec.
Cellulose.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	...	...	...	Not prec.
"Para cellulose"	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	...	...	...	Not prec.
"Meta cellulose"	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	...	...	...	Not prec.
"Vasculose"	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	...	...	...	Not prec.
"Extractive"	Sol.	Ins.?	Sol.?	Ins.	Ins.	Ins.	Ins.	Sol.?	...	...	Reduced?	Not prec.
Colours	Sol.?	Ins.?	Sol.?	Ins.	Ins.	Ins.	Ins.	Sol.?	...	...	...	Not prec.

* "Para cellulose" soluble in ammonia-cupric oxide after boiling with dilute H Cl.

† Glucosides reduce Fehling's solution after boiling with dilute acids; same with sucrose.

An? shows that some marked variations or exceptions occur. Sp. = sparingly soluble. Sol. = soluble. Ins. = insoluble.

B. INSOLUBLE IN ABSOLUTE ALCOHOL.

c. Soluble in water.

c¹. Precipitated by subacetate of lead.

Some colours, extractives, albuminoids (rarely), organic acids, and inorganic acids of ash. Weigh in Gooch's filter, ignite cautiously, and again weigh; loss equals organic matter precipitated.

c². Not precipitated by subacetate of lead.

Alkaloids, glucosides, sucrose, glucose, some extractives. Determine by difference between c and c¹. Remove Pb by H₂S, H₂SO₄, Na₂CO₃, or other means, and titrate for sucrose and glucose.

d. Insoluble in water.

d¹. Soluble in dilute hydrochloric acid.

Some alkaloids and glucosides. Determine by difference between d and d².

d². Insoluble in dilute hydrochloric acid.

Few resins, some extractives, and colour substances. Dissolve in alcohol, evaporate, and weigh in a tared dish.

In some cases it may be preferable to use the following method for analysis of the eighty per cent. alcohol extract; it is more desirable when the plant examined contains a considerable amount of sugars, tannic acid, etc.

Alcohol Extract, dilute to 200 c.c. with eighty per cent. alcohol.

1. In 20 c.c. determine total organic matter and ash.

2. In 20 c.c. determine total organic matter and ash that are soluble in water, and, by difference, total organic matter insoluble in water.

3. Evaporate the remaining 160 c.c. to dryness, treat with water, filter, and make the filtrate measure 160 c.c. Reserve the insoluble matter on the filter for examination. (10.)

4. In 20 c.c. of the aqueous solution determine tannin gravimetrically by A. Carpeni's method;* precipitate by ammoniacal acetate of zinc, use a Gooch's filter, wash the precipitate with very weak ammonia, dry at 120° C., weigh, ignite cautiously, again weigh. The loss by ignition equals tannic acid, in absence of certain interfering substances.

5. Precipitate 20 c.c. by normal acetate of lead, and determine, as before described, the amount of organic matter after drying at 100–120° C. This precipitate will contain, if the substances are

* *Chem. News*, July 9, 1875, page 19, from *Gaz. Chim. Ital.*, 1875, No. 3; *Proc. Am. Ph. Assoc.*, 1875, p. 341.

present in the plant, tannic, gallic, and most other organic acids, some colours, rarely albuminous substances, some extractives, and most inorganic acids of the ash. Determine, by difference, the amount not precipitated by this treatment.

6. In 20 c.c. determine in like manner the amount precipitated by basic acetate ("subacetate") of lead. This reagent precipitates a greater number of acids, colours, and extractives than are precipitated by the normal acetate, hence it is frequently possible to estimate such substances by subtracting the amount precipitated by one reagent from the amount precipitated by the other. To the filtrate add a slight excess of dilute hydrochloric acid, boil gently for half an hour, and determine in the liquid total glucose by use of Fehling's solution.

7. Precipitate 20 c.c. by subacetate, exactly as in 6, and use the precipitate as a duplicate to check the amount there estimated. To the filtrate add a very slight excess of solution of carbonate of sodium, filter from the carbonate of lead, wash well with water containing a little alcohol, and in the filtrate estimate actual glucose. If the glucose thus found is appreciably less than that in 6, subtract it from that amount; this glucose may be due to the presence in the plant of sucrose or some glucoside. If due to sucrose, the amount of the latter may be found by multiplying this residual glucose by .95; if to a glucoside, a fit subject for an extended investigation is presented. The properties, formula, and decomposition products of the newly-found glucoside should be carefully studied.

8. Precipitate 20 c.c. with subacetate of lead, as in 6 and 7, employing the precipitate as material from which to separate organic acids, after removal of lead by sulphuretted hydrogen. Acidulate the filtrate with sulphuric acid, add an equal volume of alcohol, allow to stand two hours, filter, wash the precipitate with fifty per cent. alcohol, and evaporate the filtrate until all alcohol has been dissipated. Test the acid solution for alkaloids, glucosides, sugars, extractives.

9. Reserve the remaining 40 c.c. for duplicating any unsatisfactory determination.

10. The residue mentioned in 3 as insoluble in water may contain resins, albuminoids (especially from seeds), colours, alkaloids, glucosides. Dilute acids remove alkaloids and some glucosides, dilute ammoniac hydrate will remove some resins, colours and glucosides. Any still insoluble residue probably contains albuminous or resinous substances.

VII. *Estimation of Cold Water Extract.*

That part of the plant remaining insoluble after treatment with alcohol should be dried at 100°C . and completely extracted by cold water. When the plant contains considerable mucilaginous matter, this is best removed by placing the substance in a flask or graduated cylinder, and then adding a measured volume of cold water. Allow to macerate, with frequent agitation, for from six to twelve hours; then filter through fine washed linen, and evaporate a measured portion of the solution. In this residue determine total organic matter and ash. This residue usually contains little but gum; in analysis of fruits and fleshy roots pectin bodies, salts of organic acids, rarely a substance resembling dextrin, and small amounts of albuminous substances and colouring matter. Usually the separation of these substances is very difficult. The unevaporated liquid should be used for such qualitative reactions as are necessary to show the nature of the substances extracted. The insoluble residue should be well washed with water, transferred to a crucible, and completely dried at 110°C . This residue should be then weighed.

VIII. *Estimation of Acid Extracts.*

The dried residue insoluble in cold water should be transferred to a beaker containing 500 c.c. of water and 5 c.c. of concentrated sulphuric acid (sp. gr. 1.84). Boil for six hours, on a gauze support, adding water to keep the volume of liquid unchanged; if the substance be very starchy, a longer boiling may be necessary. This treatment will convert starch and its amorphous isomers into dextro-glucose, and will occasionally remove some salt of an organic acid, and usually traces of albuminous and indeterminate substances.

The total amount extracted may be found by washing, drying at 100°C ., and weighing the yet insoluble residue, and subtracting the weight from the one taken after extracting with cold water. The amount of starch and isomers may be found by determining in a given volume of the acid filtrate the amount of glucose, using Fehling's solution; the glucose thus found multiplied by .9 equals starch and isomers. The total extract minus starch and isomers equals acid extract not starch. This includes a small amount of ash, which may be approximately determined by evaporating and igniting a known volume of the solution. Where it is wished to separate the extracted matter from the sulphuric acid, boil the liquid with an excess of powdered barium carbonate until no acid reaction remains. Filter, and evaporate to dryness. The residue consists chiefly of hydrated dextro-glucose ($\text{C}_6\text{H}_{12}\text{O}_6\cdot\text{H}_2\text{O}$), with some ash.

IX. Estimation of Alkali Extract.

Wash well and dry at 110° C. the residue from treatment with acid, and record its weight. Boil this residue, for two hours, with 500 c.c. of a solution containing 20 grams of sodic hydrate to the litre. Filter through fine washed linen, and wash the residue thoroughly with hot water, alcohol, and ether. Transfer it to a weighed crucible, dry at 110 – 120° C., and weigh the residue as crude fibre and ash; this weight subtracted from the previous one shows the total alkali extract. The extract is largely albuminous matter and various modifications of pectic acid, Fremy's "cutose," and various colouring, humus, and decomposition compounds in small amounts. Most of the extracted substances may be precipitated by excess of an acid with or without the presence of alcohol.

X. Cellulose.

The crude fibre from IX. should be treated with from 50 to 100 c.c. of U. S. P. solution of chlorinated soda, and allowed to stand twenty-four hours. If not then bleached white, slightly acidulate with hydrochloric acid, and set aside for another day. Filter through fine linen, or Gooch's filter, wash with hot water, dry at 110 – 120° C., and weigh, ash free, as cellulose. The loss of weight by this treatment state as lignose and colour.

Remarks.

It is advisable to determine always, in addition to what has already been directed, the amounts extracted directly from the sample by water, ether, alcohol of various percentages, methylic alcohol, naphtha, chloroform, carbon disulphide, etc. In each extract estimate total organic matter and ash, determine qualitatively, and quantitatively when possible, its constituents, by treating with such solvents and reagents as are indicated. Each extract being composed of certain distinct substances, it is necessary to account for them in every case.

The amounts present of some constituents may be found by subtracting the weight extracted by some one solvent extracted by some other. It will be seen that this is a method of limited applicability, which can only be applied in those cases where the difference between the solvent action of the two liquids is very sharply defined. Certain special methods for the estimation of single constituents may be used, care being taken that all interfering substances be first removed. The methods of preparation of known substances as given in Husemann's "*Pflanzenstoffe*," and to a considerable

extent in Watt's "Dictionary," may serve as suggestions for work. Treatment with benzol, alcohol of 80 per cent., and water, removes from nearly all the plants the constituents of greatest chemical and medicinal interest, but in analysis of grain, fodder, and food materials, those compounds extracted by dilute acids and alkalies have great value. There are substances in plants, seemingly isomers of starch and cellulose, which have properties more or less resembling those of cellulose, and are changed by boiling with dilute acids to glucose. In absence of an established nomenclature it has seemed best to use the terms "starch isomers," or "amylaceous cellulose" for these substances, while those constituents, not albuminous, which are removed by dilute alkali, have been termed "alkali extract." These substances have been investigated by various chemists, but no definite and authoritative nomenclature has yet been adopted. Thomson gives the name "holz-gummi," *wood-gum*, to a white substance extracted from plants by dilute sodic hydrate, while Fremy regards these various compounds as modifications of pectic acid, pectin, and "cellulose bodies." Starch also may exist in some seeds (as of sweet corn) in a form soluble in water.

It will be seen that the field for investigation is limitless, and almost unoccupied as yet, and that there is great need for improved methods for proximate analysis. The analyst will find that the study of any common plant will require of him much more than unthinking, mechanical habits of manipulation, while every careful investigation will reveal to him some constituents deserving more full and accurate study.

Methods for the Quantitative Determination of the Alkaloids in Plants. A. Loesch. (*Pharm. Zeitschr. für Russland*, xviii., 545. From *Journ. Amer. Chem. Soc.*).

A. Methods for the Determination of the Solid Alkaloids.

1. The method of Stas, perfected later by Erdmann and Uslar, Dragendorff, and others, and used for chemico-legal investigations, consists in extraction with water acidulated with hydrochloric acid, addition of ammonia to produce alkaline reaction, repeated extraction with continually renewed portions of ether, chloroform, amyl alcohol, or benzol, separation of the watery liquid from the solution of the alkaloid, extraction of the latter by shaking with acidulated water, and repetition of the treatment until the solution of the alkaloid is colourless. It is then evaporated in a weighed vessel, and the residue dried at a 100–110° C. Instead of treating the plant with acidulated water, the author treated it with alcohol of 90 per cent.,

acidulated with hydrochloric, oxalic, tartaric, phosphoric, or sulphuric acid, and evaporation and re-solution in water, before treating with ammonia, etc. By this means the mucus, starch, gum, and albuminoids remained undissolved in the residue from the extraction with alcohol. While this method yields the alkaloids in a very pure state, it is attended with a large loss, and is, in the presence of certain viscid substances and albuminoids, both difficult and tedious.

2. The method of Claus for the estimation of theine and quinine. In the first case, the tea leaves are extracted with ether, the latter removed, for the most part, by distillation, and the residue extracted with water acidulated with sulphuric acid until it no longer tastes bitter. The acid liquor is mixed with excess of burnt magnesia, evaporated to dryness on the water-bath, the residue pulverized and extracted with ether. In the determination of the quinine, the pulverized bark is thoroughly exhausted with water acidulated with sulphuric acid, the extract evaporated to dryness with excess of burnt magnesia, and extracted with ether. This method gives satisfactory results, and can, without doubt, be employed in the quantitative determination of all other solid alkaloids. It does not, however, yield the alkaloids in a pure condition.

3. The methods of R. Wagner, Sonnenschein, Husemann, Marmé, and Schultz, are based on the precipitation of the alkaloids by iodine and potassium iodide, phosphomolybdic and phosphotungstic acids, or potassiomeric iodide, from the extract obtained with acidulated water. The precipitates, according to their nature, are decomposed by warming with barium hydrate, hydrogen sulphide, or a mixture of stannous chloride and caustic alkali, and the alkaloids dissolved out with ether. These methods are not only attended with a large loss, but yield impure products.

4. F. J. Mayer recommends titration with a standard solution of potassiomeric iodide. This method gives inexact results, owing to the necessity of decolorizing the solution, and consequent loss of substance, and to the difficulty of determining the end of the titration.

The author's method is as follows:—The cut or coarsely powdered vegetable substances are twice warmed for three hours in the water-bath, with alcohol of 90 per cent. acidulated with hydrochloric acid, then pressed and washed with alcohol of the same strength. The volume of the collective alcoholic liquids is then reduced by distillation to two-thirds, the cold residue filtered, washed with alcohol, and the filtrate concentrated on the water-bath to the

consistence of an extract. The residue is warmed with twice the weight of the original substance of water acidulated with sulphuric acid, cooled and filtered. The filtrate is mixed with thrice its volume of cold saturated solution of alum, ammonia added in slight excess (*i.e.*, more than necessary to precipitate the alumina), evaporated to dryness on the water-bath, the residue pulverized, and exhausted with the solvent suited to the alkaloid to be extracted; *e.g.*, quinine is extracted with ether, and cinchonidine with alcohol of 90 per cent.; the residue from the leaves and roots of *Atropa belladonna*, from the leaves and seeds of *Hyoscyamus niger*, and the leaves of *Aconitum Napellus*, with ether; that of rad. ipecac., with alcohol of 20 per cent., etc. The ethereal or alcoholic solutions of the alkaloids are evaporated to dryness, dried at 110° C., and weighed. The alkaloids are thus obtained as perfectly colourless crystals, leaving no residue when heated on platinum foil. The results obtained by the author, with the foregoing methods, are given in the following table:—

Material.	Alkaloid.	Percentage Extracted.				
		Method.				Method of the Author.
		I.	II.	III.	IV.	
Peruvian Bark, <i>yellow</i> .	{ Quinine.	2.735	3.175	2.460	2.570	3.250
	{ Cinchonidine . . .	0.194	0.250	0.187	0.175	0.285
" " <i>red</i> .	{ Quinine.	1.105	1.195	1.085	1.005	1.235
	{ Cinchonidine . . .	0.425	0.500	0.400	0.395	0.525
" " <i>brown</i> .	{ Quinine.	0.895	0.950	0.825	0.800	0.975
	{ Cinchonidine . . .	2.485	2.975	2.350	2.300	3.075
Leaves of <i>Hyoscyamus</i> .	{ Hyoscamine {	0.099	0.145	0.085	0.074	0.175
Seeds of " .		0.197	0.225	0.180	0.100	0.285
Leaves of <i>Atropa Bella-</i> <i>donna</i>	{ Atropine	0.115	0.197	0.100	0.090	0.235
Roots of <i>Atropa Bella-</i> <i>donna</i>		0.300	0.325	0.275	0.225	0.375
R. Ipecac.	Emetine	0.720	0.800	0.550	0.475	0.875
Folia <i>Aconiti</i>	Aconitine	0.300	0.395	0.265	0.220	0.425

In the case of substances of unknown nature, the residue of the evaporation with ammonia and alum must be successively treated with the different solvents, *i.e.*, first with ether, then with chloroform, then with amylic alcohol, and finally, with alcohol. It is by this means not only possible to extract the entire amount of alkaloids, but also to effect a separation of those of different solubilities in cases where more than one are present.

The special precautions for the successful conduct of the fore-

going method are: 1. The alcohol must be completely expelled from the alcoholic extract, by evaporation on the water-bath. 2. Both the alcoholic and aqueous liquids must be filtered cold. The author finds, as the result of numerous experiments, that the best solvent for the alkaloids, in general, is amylic alcohol; then follow ether, chloroform, and benzol, which latter, except in a few cases, dissolves the smallest quantity.

B. Methods for the Determination of the Liquid Alkaloids.

In the methods hitherto in use the vegetable substances are either distilled with potassium or calcium hydrates, the distillate saturated with hydrochloric acid, evaporated to dryness on the water-bath, and the residue distilled with potassium hydrate; or they are exhausted with acidulated water, the filtered liquid evaporated, and then distilled with potassium or calcium hydrate. As all plants contain not only ammonia, but nitrogenous substances which evolve ammonia when warmed with alkalies, the distillate, after neutralization with hydrochloric acid, is evaporated to dryness, and the residue exhausted with strong alcohol; the ammonium chloride remains undissolved, the alcoholic solution is evaporated to dryness, and the residue exhausted by shaking with solution of potassium hydrate and ether. The ethereal solution is then evaporated, at first at ordinary temperatures, and then over calcium chloride, or hydrate, to remove the moisture. In quantitative estimations, the clean ethereal solution is shaken with a measured volume of standard hydrochloric acid, the ether evaporated off at the lowest possible temperature, and the excess of acid determined by titration. The disadvantages of the foregoing method are: 1. Ammonium chloride is not absolutely insoluble in strong alcohol. 2. A certain proportion of the hydrochloric acid volatilizes with the ether, at temperatures even below 50° C. The error of the method is therefore one of excess.

The following method of the author permits an easy and exact determination of the liquid alkaloids:—

A weighed quantity of the substance is boiled with water acidulated with hydrochloric acid, the residue pressed, and washed with water. The collective solutions are evaporated to one-fourth, and the residue distilled with calcium hydrate (carefully cooling the distillate). The distillation is continued until the last portions give no alkaline reaction with litmus paper. Potassium and sodium hydrates cannot be used, owing to their destructive effects on the alkaloids. The colourless distillate is exactly neutralized

with sulphuric acid, evaporated to dryness on the water-bath, the residue pulverized and exhausted with alcohol of 90 per cent. The ammonium sulphate remains entirely undissolved, while the sulphates of the alkaloids pass into solution. The solution is evaporated to dryness, the residue shaken three times with ether and solution of potassium hydrate, the ethereal solution treated with a measured quantity of standard sulphuric acid, the ether distilled off, and the excess of sulphuric acid determined in the residue by titration.

The following determinations of conine and nicotine were made by the foregoing methods:—

	Method with H Cl. Per cent.	Method of the Author. Per cent.
Leaves of <i>Nicotiana Tabacum</i> . .	5.750 .	5.250
Plant of <i>Conium maculatum</i> . .	0.075 .	0.060

The Alkaloids of Pomegranate Bark. C. Tanret. (*Comptes Rendus*, xc., 695.) In a previous report (see *Year-Book of Pharmacy*, 1879), the author announced that pelletierine, the alkaloid isolated by him from the bark of *Punica Granatum*, was associated in that bark with three other volatile alkaloids. He now supplies some further information respecting these bodies.

The four alkaloids described by him are *methylpelletierine*, $C_9H_{17}NO$, *pseudopelletierine*, $C_9H_{15}NO$, *pelletierine*, $C_8H_{15}NO$, and *isopelletierine*, $C_8H_{15}NO$.

Methylpelletierine is a liquid base boiling at $215^\circ C.$, and soluble in 25 times its own weight of water at $12^\circ C.$, and very freely soluble in alcohol, ether, and chloroform. Its salts are very deliquescent. The hydrochlorate has a rotatory power for α_D of $+22^\circ$. *Pseudopelletierine* is a crystalline solid. *Pelletierine* is a colourless liquid, boiling at 195° under ordinary pressure, with partial decomposition, but may be distilled unchanged under reduced pressure. It dissolves in 20 times its own weight of water, and is soluble in all proportions in alcohol, ether, and chloroform; its sp. gr. at 0° is 0.988° . When exposed to oxygen it is rapidly converted into a resinous mass. The salts of this alkaloid become acid when heated either in the dry state or in solution. The sulphate has a rotatory power for α_D of -30° . If the free alkaloid be heated to 100° , this rotatory power disappears. *Isopelletierine* is a liquid alkaloid isomeric with pelletierine, and agreeing with the latter in its density, boiling point, and solubility in water, but differing from it by having no action on polarized light.

To prepare these alkaloids the powdered pomegranate bark is

mixed with milk of lime, the mixture exhausted with water, the resulting solution shaken with chloroform, and the latter agitated with water acidulated with sulphuric acid. The solution of sulphates thus obtained is treated with an excess of sodium bicarbonate, then shaken with chloroform, and the latter again agitated with a solution of sulphuric acid. The resulting liquor contains the sulphates of methylpelletierine and pseudopelletierine, as both these alkaloids are displaced from their salts by sodium bicarbonate, while pelletierine and isopelletierine are not. The two latter are therefore left in the liquor containing the bicarbonate, from which a solution of their sulphate may be obtained by the addition of caustic potash, and the repetition of the treatment with chloroform and dilute acid. In order to separate methylpelletierine from pseudopelletierine, the solution of the sulphate of these two bases is partially decomposed by an alkali, then shaken with chloroform, and this afterwards with an acid. The methylpelletierine is concentrated in the first portion set free, and after repeating this treatment several times, a point is reached at which the rotatory power of the product is no longer increased, at which stage the sulphate of methylpelletierine thus produced may be considered as pure. To obtain the free base a saturated solution of the salt is decomposed by an alkali, and the liberated alkaloid dehydrated over fragments of potash and distilled in a current of hydrogen. Pseudopelletierine is obtained by concentrating the liquor from which the methylpelletierine has been removed, treating it with potash, shaking with ether, and allowing the ethereal solution to evaporate. For the separation of pelletierine from isopelletierine, the solution of the two sulphates, obtained as above, is evaporated over sulphuric acid, and the dry residue exposed to the air upon folds of filtering paper, when after a short time it partially deliquesces, leaving on the surface of the paper non-hygroscopic crystals of sulphate of pelletierine, while a saturated solution of sulphate of isopelletierine penetrates the paper. The free alkaloids are obtained from their salts by the same process as methylpelletierine, the distillation being conducted at a low pressure to prevent decomposition.

Chloride of Zinc as a Reagent for Alkaloids. A. Jorissen. (From *Chem. Zeit.*) The reagent suggested by the author is a solution of 1 gram of chemically pure anhydrous zinc chloride in 60 c.c. of a mixture of equal volumes of strong hydrochloric acid and water. A few drops of the solution of the alkaloid or of its hydrochlorate are carefully evaporated to dryness on the inner side of a crucible lid in a water-bath. The residue is moistened with 2 or 3 drops

of the zinc solution, and the lid again gently warmed. As the solution slowly evaporates, coloured rings, characteristic of certain alkaloids, will be found to appear at the margin of the still liquid portion. Strychnine thus produces a pink, thebaine a yellow, narceine an olive-green, delphinine a brownish red, berberine a yellow, veratrine a red, quinine a pale green, digitalin a chestnut-brown, salicin a reddish violet, and santolin a blueish violet coloration.

The Purity of Commercial Trimethylamine. E. Duvillier and A. Buisine. (*Comptes Rendus*, lxxxix., 48-51.) Commercial trimethylamine, prepared by the dry distillation of beet molasses, contains other substances besides trimethylamine. It is free from ammonia, and when treated with oxalic acid yields a dense white precipitate. The filtrate concentrated by distillation yields a further precipitate. These two precipitates are mixed, and separated by boiling water into three portions, one of which is insoluble in hot water, but which melts and floats on the surface of the liquid, and solidifies like wax on cooling; another more soluble in hot water than the first; and a third still more soluble, especially in hot water.

The first body, which is di-isobutyloxamide, after recrystallization from alcohol, is obtained in pearly needles, which melt in boiling water. The free base has a slightly aromatic odour, and yields a platinochloride crystallizing in orange-coloured plates, and slightly soluble in water.

The second product crystallizes from alcohol in pearly needles (m. p. 110°), and consists of dipropyloxamide. The free base gives an orange-coloured precipitate with platinum chloride.

By recrystallizing the third product from water and alcohol, a granular substance is obtained, intermediate between dipropyloxamide and dimethyloxamide. The presence of the former body is probably the cause of the latter not crystallizing in the ordinary manner. This body when decomposed with potash yields a base which forms a golden-yellow precipitate with platinum chloride, possessing all the properties of the methylamine compound described by Wurtz (*Ann. Chem. Phys.* [3], xxx., 457), and with which the results of the analyses correspond.

The bodies not precipitated by oxalic ether consist of di- and trimethylamine, and are contained in the mother-liquors (residue and distillate). The bases are distilled and collected in absolute alcohol, and the solution treated with oxalic ether. When the reaction has ceased, the liquid is distilled and the unattacked base which distils over consists of trimethylamine.

The residue is dissolved in water, and caustic baryta is added; barium oxalate is precipitated, which is separated, and the excess of baryta precipitated with carbonic anhydride. The filtrate is evaporated, and the residue dissolved in alcohol at 80°. On cooling an amorphous mass is left, perfectly insoluble in absolute alcohol, but very soluble in water. It consists of barium dimethyloxamate, and on decomposition with potash yields dimethylamine, the double platinum salt of which forms octahedra.

It is therefore evident that commercial trimethylamine is not pure, as Vincent (*Bull. Soc. Chim.*, xxix., 194, and ccxvii., 151) declares it to be. The quantity of triethylamine present is but small, only from 5 to 10 per cent., that of the dimethylamine being about 50 per cent., whilst the remainder consists of methylamine, propylamine, and butylamine, in about equal proportions.

Umbelliferone Derivatives. F. Tiemann and C. L. Reimer. (*Ber. der deutsch. chem. Ges.*, xii., 993-999. From *Journ. Chem. Soc.*)

Umbelliferone, $C_9H_6O_3$, or $C_6H_3(OH) \left\langle \overline{O} \right\rangle CO$, is prepared by subjecting an alcoholic extract of galbanum resin to dry distillation, and extracting the distillate with hot water. It is deposited from the aqueous extract in colourless needles (m. p. 223°), which dissolve readily in alcohol. 100 parts of boiling water dissolve 1 part of umbelliferone. This substance dissolves in strong acids, but is reprecipitated on the addition of water. When a solution of umbelliferone in potash is heated to 60°, it takes up two atoms of hydrogen, forming umbellic acid.

Acetumbelliferone, $C_{11}H_8O_4$, or $C_9H_5O_3Ac$, prepared by the action of acetic chloride or anhydride on umbelliferone, melts at 140°, and dissolves freely in alcohol and ether. It is identical with the β -acetumbelliferone, or acetoxycoumarin of Lewy and Tiemann (*Ber. der deutsch. chem.-Ges.*, x., 2215).

Methylumbelliferone.— $C_9H_5(CH_3)O_3$, obtained by digesting a solution of umbelliferone in methyl alcohol with methyl iodide and potash, crystallizes in glistening scales (m. p. 114°), which are soluble in alcohol and ether. The crystals dissolve in sulphuric acid, forming a blue fluorescent solution, but are reprecipitated by the addition of water. Methylumbelliferone is not attacked by a boiling solution of potash.

The dioxybenzoic acid which is formed, together with resorcinol, when umbelliferone is fused with potash, splits up into carbonic anhydride and resorcinol at 200°.

Estimation of Vanillin. W. Haarmann and C. L. Reimer. (*Che-*

miker Zeitung, 1879, No. 51.) Vanillin may be accurately estimated, either in the natural pods or in artificial samples by shaking the ethereal extract with a solution of sodium bisulphide, which readily takes up the vanillin. Its combination with the bisulphide is then decomposed by the addition of sulphuric acid, and the pure vanillin separated from the liquid by agitation with ether.

The Digestive Ferments, and the Preparation and Use of Artificially Digested Food. Dr. W. Roberts. (The Lumleian Lectures, delivered before the Royal College of Physicians.) These lectures are a very important and most interesting contribution to modern medical literature, and as such we strongly recommend them to the notice of the reader. They are, however, too voluminous to be reprinted in this work, and are not suited for useful abstraction. A full account will be found in the *Pharmaceutical Journal* of May 8th, 15th, 29th, and June 5th, 12th, and 26th, as well as in the leading medical journals.

Peptone. R. Herth. (*Wein. Akad. Ber.* [2], lxxvi. 869-890. From *Journ. Chem. Soc.*) Peptone was prepared by digesting the finely powdered whites of from 50 to 60 boiled eggs for twenty-four or thirty hours with a 1 per cent. solution of phosphoric acid, then treating with hot water, and digesting with 4 litres of a 0.65 per cent. solution of phosphoric acid and 40 c.c. of a clear pepsin solution which had been purified by dialysis, and was free from calcium and chlorine. When the liquid had become clear (after five or six hours) it was heated on a sand-bath, and freshly precipitated lead carbonate was added to neutral reaction. The small quantity of lead present in the filtrate was removed by sulphuretted hydrogen; the liquid was again filtered, concentrated on the water-bath, precipitated, and digested with concentrated alcohol, again dissolved, and the liquid re-precipitated. This process was repeated three times. The precipitated lead phosphate was quite white, showing the absence of sulphide. A concentrated solution of the peptone thus prepared gave a slight turbidity with potassium ferrocyanide and acetic acid. Various methods of purification were employed, but the reaction with ferrocyanide was invariably obtained. Whether this reaction is due to a trace of unchanged albumen in the peptone, is regarded by the author as a yet unsettled point.

In the original paper a number of analyses of the peptone are given, both of the substance prepared as described above and of the various precipitates obtained by fractionally precipitating with alcohol and with lead acetate and ammonia. These analyses show that peptone is not a mixture, but a distinct chemical compound.

The percentage composition of peptone appears to be identical with that of albumen obtained from egg-white. The author regards albumen as a polymeride of peptone, and the change brought about by the action of pepsin solution in albumen as analogous to the action of heat in effecting the change of paraldehyde into vapour of aldehyde.

A solution of peptone is not precipitated by many of the salts of the heavy metals, by acids, or by boiling. Alcohol, mercuric chloride, and lead acetate, followed by ammonia, cause precipitates in solutions of peptone. The statement of Adamkiewicz ("Die Natur und Nährwerth des Peptons," Berlin, 1877) that those reagents which precipitate egg albumen also precipitate peptone, is regarded by the author as incorrect. Peptone forms compounds with metals analogous to those formed by albumen, but the compounds of peptone are generally soluble, whilst those of albumen are insoluble.

The author claims for his process of preparing peptone, that it ensures a complete or almost complete conversion of the albumen into peptone, that it entirely removes syntonin, and that the absence of salts of the alkaline earths is also ensured. These salts are very difficult to remove from solutions of peptone.

The amount of ash in the peptone prepared by the author's process is not more than 1 per cent.

Chemical Composition of Peptones. A. Kossel. (*Ber. der deutsch. chem.-Ges.*, xii., 703.) The author's analyses show that fibrin-peptone contains 48.9 per cent. of carbon, and not 51.4 per cent. as stated by Maly and Henninger. He believes that the composition of the products of digestion varies with the energy of the action of the pepsin.

Pancreatic Digestion. E. Salkowski. (*Ber. der deutsch. chem.-Ges.*, xii., 701.) By digesting albumen with pancreatic juice for fourteen hours, a volatile compound is produced which is coloured purple-red by nitric acid, agreeing in this reaction with a body obtainable from human urine by distillation (*Pflüger's Archiv*, xvi., 309.) The same substance is also contained in the fæces. The putrefaction of dried muscle and horn yielded shonol, and a crystalline acid fusing at 76° C., readily soluble in alcohol and ether, but difficultly so in water. This acid, in the author's opinion, is possibly a paratoluic acid.

Products of the Fermentation of Albuminoids. E. and H. Salkowski. (*Ber. der deutsch. chem. Ges.*, xii., 648-653. From *Journ. Chem. Soc.*) The decomposition of the several proteids investigated

by the authors, viz., wool, serum, albumen, blood and muscle fibrin, and fresh muscle, was effected by digesting them at 40° , for periods of three to sixty days, with a dilute solution of sodium carbonate (15 c.c. of the saturated solution diluted with 1,000 c.c. of water to 50 grams of the dry substance). In certain cases pancreatic juice was added, in others a few drops of a decomposing fluid containing *Bacillus subtilis*. On the completion of the decomposition the solutions were distilled, and the distillate and the residue separately treated for the solution of the products.

Blood and muscle fibrin, and fresh muscle, all yielded phenylpropionic acid, in quantity about 0.5 per cent. of the dry substance, the duration of the digestion varying from three to thirteen days. In one instance in which fresh muscle was digested for thirteen days, this acid was not formed, but a small quantity of phenylacetic acid was isolated.

Commercial serum albumen (125 grams), after digestion of thirty-seven days, also yielded phenylacetic acid (3 grams.) The same acid was obtained from wool, in quantity about 0.6 per cent., and in addition an aromatic acid, $C_8H_8O_3$ (m. p. 148°), differing, however, in its properties from the known isomerides of this formula. It is probably one of the unknown oxyphenylacetic acids.

The early stages of the decomposition of muscle were attended by the formation of succinic acid, the maximum quantity observed being 1 per cent. of the dry substance. It is probably preceded by that of aspartic acid.

Muscle which had been previously treated in a dry, finely divided state with boiling ether, yielded by decomposition a quantity of the higher fatty acids (3 per cent.); so also serum albumen.

In the further investigation of the products of decomposition of muscle, the following bodies were isolated from the distillate:—

Before the boiling point was reached, a small quantity of a heavy yellowish oil distilled. This proved to be a non-nitrogenous sulphur compound.

From the succeeding portions phenol, indole, and skatole (*Ber.* x., 1027) were isolated. The occurrence of the latter body, however, was not constant. The quantity of indole obtained is remarkable; in one case 100 grams of dry substance yielded 0.9 gram of pure indole.

Diastase. C. Zulkowsky. (*Wiener Akademische Berichte*, lxxvii., 647.) The author has made several analyses of pure diastase, the mean result of which is expressed in the following numbers:—

Carbon	.	.	.	.	.	.	47.57
Hydrogen	.	.	.	.	.	.	6.49
Nitrogen.	.	.	.	.	.	.	5.14
Oxygen and Sulphur	.	.	.	.	.	.	37.64
Ash	.	.	.	.	.	.	3.16

100.00

The ash consists of phosphates of magnesium, calcium, and potassium, and small quantities of sulphates.

The paper contains a detailed description of the process by which the diastase was prepared.

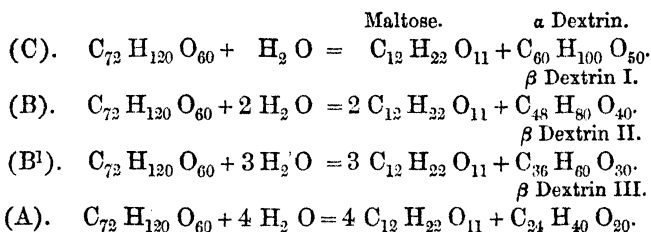
Occurrence of a Substance resembling Diastase in Beetroot. C. Zulkowsky. (*Wiener Akademische Berichte*, lxxvii. 654.) The author has extracted from beetroot a substance strongly resembling diastase, by a process similar to that employed for the extraction of diastase from malt. The substance is still under investigation.

Diastase. M. Baswitz. (*Ber. der deutsch. chem. Ges.*, xii., 1827.) In a previous paper (*Ber.*, xi., 1443), the author stated that the conversion of starch into sugar by diastase is favoured by the presence of carbonic acid. He now reports that certain kinds of commercial starch, such as potato, rye, and barley starches, are acted upon by diastase as readily in the absence as in the presence of carbonic acid. The temperature most favourable to the action is about 50° C.

A Contribution to the Chemistry of Starch. Dr. V. Griessmayer. (*Chem. News*, xl., 180.) The following transformation products originate on the action of diastase or of dilute sulphuric acid upon starch:—(1) Soluble starch, insoluble in water of from 50° to 60°; in the solid state it is coloured by iodine blue, but in an aqueous solution a vinous red, and if dried up with an excess of iodine becomes violet, yellow, or brown. (2) Erythrodextrin, which is chiefly met with in commercial dextrin; it is never insoluble in water, and is coloured red by iodine, both in the solid state and in the solution. (3) The achroodextrins, α , β , and γ , which take no colour with iodine. α can be partially converted into sugar, but less easily than 1 and 2. β resists the action of diastase for twenty-four hours at least. γ is not attacked by diastase for a year at least. (4) Maltose, not readily attacked by diastase. (5) Glucose. The author considers starch as a poly-saccharide of the formula $n(C_{12}H_{20}O_{10})$, in which n must be first determined, but cannot be less than 5 or 6.

On the Transformation Products of Starch. C. O'Sullivan. (*Pharm. Journ.*; from a paper read before the Chemical Society,

Nov. 6th, 1879.) The author commences by re-asserting that the molecule of starch under the influence of malt extract splits up in one of four way.



Other proportions of maltose and dextrin have been observed, but these are due to either the splitting up of the starch, partially according to one equation, and partially according to one or more others, or to the further action of the active agents of malt extract on the dextrin first produced. The proportions of maltose and dextrin represented by the equation of MM. Musculus and Gruber belong to the latter class. These chemists confirm the author's work as far as it relates to maltose, but have made a serious error (about 2 per cent.) in calculating the specific rotatory power, as they have taken 220 mm. of a 1 per cent. solution of maltose to give a deviation of 13.5 divisions on the scale of the Soleil-Duboscq instrument: this number should be 13.75. MM. Musculus and Gruber point out at least three dextrans with different optical activity and cupric oxide reducing powers. The author declares the existence of four distinct dextrans to be highly probable; but states that all, when pure, have the same optical activity, but that none are reducing bodies. Soluble starch has the same optical activity as the dextrans, but like them does not reduce when pure. The author then gives details of the preparations and properties of soluble starch and the various dextrans, criticising the statements and methods of MM. Musculus and Gruber, as well as the various products obtained by them. In the second part the author investigates the action of malt extract on the transformed products. At first sight it would seem probable that the starch molecule breaks down first into maltose and α dextrin. The latter is then converted into maltose and β dextrin I., which in its turn forms maltose and β dextrin II., etc. The author has made many experiments to elucidate this question, and finds that the above theory, viz., the breaking down of the starch molecule into dextrin molecules, which become smaller at each step, is not supported by all the facts.

Continual work with these bodies has forced the author to the conclusion that they are not a series of polymers, but rather a series of bodies of the same molecular weight, in which the difference in their behaviour must be accounted for by a difference of relation in the arrangement of the molecules to one another, probably in solution alone. We may take it, continues the author, that the molecule of soluble starch, or the dextrin, giving a purple with iodine, is simply $C_{12}H_{20}O_{10}$, but that these molecules in solution are arranged in groups of six sixes, all the groups being in an intimate state of tension one with another, so that the motion affecting one under certain conditions affects all under the same condition. In conclusion, the author states that the theory of splitting up and breaking down of the starch molecule as represented by the equations, does not hold all the facts eliminated, and is not in accord with some of them. The theory, on the other hand, of the arrangement of the molecules in groups all dependent one on the other, and capable therefore of undergoing a simultaneous movement, and the rearrangement of these groups attendant upon the hydration of a definite proportion of the molecules in each of them, holds all the facts at present known, and is in perfect accord with all of them. The author is still engaged on the chemistry of the subject, but points out that the physics ought now to be studied, and the heat absorbed or eliminated during the different transformations determined; thus some idea of the character of the apparent work done will be gained.

Contribution to the History of Starch and of its Transformation-Products. H. T. Brown and J. Heron. (*Liebig's Annalen*, vol. cxcix, Nos. 2 and 3. From *Chem. News*.) After a survey of the results obtained by former experimentalists, the authors describe the methods they have used for the purification of starch, for the preparation of starch-paste and the preparation and analysis of the extract of malt, and the analysis of the transformation-products of starch. They then examine the behaviour of starch with the extract of malt, after a preliminary notice of the changes undergone by a cold infusion of the latter, its fermentation in the cold, and its behaviour when heated. They find that the invertive action of the malt-ferment is most powerful about 55° , and ceases to act almost entirely at 66° . They then turn to the nature and properties of starch and starch-cellulose, the transformation of the insoluble cellulose, and the separation of a second body. They treat of the different glutinosity of starch-paste as occasioned by very slight differences in the manufacture of the starch. They describe the

sp. gr. of starch in the form of paste, the solubility of granulose, the optical activity of starch-paste, its behaviour with potassa; the properties of maltose, its reaction with dilute sulphuric acid and with extract of malt; the behaviour of the latter with starch, distinguishing the various kinds of grain; the action of extract of malt upon bruised starch, upon starch-paste in the cold, describing the reaction as rapid and energetic; the behaviour of malt-extract upon starch-paste in heat at a number of specified temperatures. They then treat of the detection of soluble starch or achroodextrin in presence of erythrodextrin; the influence of neutralization upon the activity of extract of malt, the molecular transformations of starch. They examine if dextrose is a product of the action of malt-extract upon starch, and reply in the negative, the product formed being maltose. Finally they discuss the nature of diastase.

Action of Bromine on Cane-Sugar. Dr. Griesshammer. (*Archiv der Pharm.*, xv. 193.) Bromine, like chlorine, when acting upon cane-sugar in the proportion of two equivalents to one, causes the formation of gluconic acid, $C_6H_{12}O_7$, together with a carbohydrate resembling fruit-sugar, and a gummy substance. The acid does not reduce Fehling's solution.

Partial Synthesis of Sugar of Milk. E. Demole. (*Comptes Rendus*, Sept. 1st, 1879.) The author has found that the two glucoses produced by the action of acids upon milk-sugar may be made to lose a molecule of water and reunite to form a molecule of lactose again. He recognises a profound difference between milk-sugar and cane-sugar in this respect. Two molecules of dextro-glucose reunited, and with loss of water, will not in any case reconstitute cane-sugar. The galactose and lactoglucose, resulting from the decomposition of lactose, were freed from acid and carefully evaporated to dryness; they were then treated with three parts of acetic anhydride, and yielded a body having all the properties of octacetylated milk-sugar. This, on decomposition with caustic baryta, yielded pure lactose, possessing the same crystalline form, optical rotatory power, and other properties as the natural material.

Lactic Fermentation. C. Richet. (*Comptes Rendus*, lxxxviii., 750.) Lactic fermentation proceeds the more rapidly the larger the surface that is exposed to the air. Up to $44^{\circ}C$. the energy of the fermentation increases with the temperature; while between 44° and 52° there is neither increase nor decrease; and above 52° the activity diminishes in proportion to the increase of temperature. This decrease appears to be due to the coagulation by heat of some albuminoid substance assisting in the fermentation. The author

attributes the resistance to fermentation of boiled milk to this circumstance. Gastric juice, pancreatic juice, and peptones increase the energy of lactic fermentation, while leucine, glycocoll, and other nitrogenous bodies are without action.

Bromide of Ethyl (Hydrobromic Ether.) J. P. Remington. (*Amer. Journ. of Pharm.*, April, 1880.) In a series of experiments intended to ascertain practically the process which could be adopted if it be deemed advisable to introduce this new agent into the U. S. Pharmacopœia, the following is selected as the best:—

Potassium Bromide (not powdered)	.	58 parts.
Sulphuric Acid, sp. gr. 1.838	.	44 „
Alcohol of 95 per cent.	.	44 „
Water	.	

Pour the water into a flask having double the capacity of the liquid ingredients above, and gradually add the acid; when the liquid has become cool add the potassium bromide, and having placed the flask in a sand-bath, adjust a thermometer, and with a bent glass tube connect the flask with a well-cooled condenser, insert a narrow glass tube in the cork of the flask, and by means of a short rubber tube connect it with a narrow glass tube which is terminated by a syphon; the shorter limb of this syphon is inserted into the bottle containing the alcohol, which is elevated three feet or more above the flask. Heat the contents of the flask to 116° C., and having attached a screw pinch-cock to the short rubber tube of the syphon, allow the alcohol to drop or flow in a small stream into the flask, carefully regulating the rate of flow so that the temperature shall not fall below 100° C., nor rise above 116° C. When all the alcohol has passed into the flask continue the distillation until the temperature rises to 116° C., and then disconnect the receiving flask. Agitate the distillate with an equal bulk of distilled water, to which has been added five parts of solution of soda (or sufficient to render the liquid slightly alkaline), and when the mixture has clearly separated into two layers, pour off the uppermost layer, and having introduced the heavier liquid into a clean flask, containing a few fragments of chloride of calcium, re-distil it.

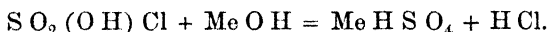
The Detection of Minute Quantities of Water in Alcohol. Prof. H. G. Debrunner. (*Amer. Journ. of Pharm.*, Sept. 1879, 446.) In the course of a series of experiments on the action of potassic permanganate on cold alcohol, the author noticed that strictly absolute alcohol, C_2H_6O , does not dissolve any of the above-named salt, the alcohol remaining entirely colourless. The addition

of one drop of distilled water to 10 c.c. of absolute alcohol, instantly produces the partial solution of a small crystal of the permanganate, which is indicated by the coloration of the liquid. The intensity of colour in this case was strong enough to be still visible on diluting the said 10 c.c. with 20 additional c.c. of absolute alcohol, thus making the total bulk 30 c.c., about one fluid ounce, which would indicate a sensibility of this test for water in alcohol equal to 0.05 per cent. It is difficult to find an absolute alcohol in the market that will stand this test; if obtained or made by further rectification it will, when used, soon absorb enough moisture from the air to betray it on testing. Commercial 95 per cent. alcohol, which, however, actually only contained 93 per cent. of C_2H_6O , became strongly coloured and looked distinctly darker than a carefully prepared 95 per cent. alcohol, which was tested at the same time. An attempt to base a colorimetric method failed, as with alcohol of less than 90 per cent. a reaction between the reagent and the alcohol takes place, whereby the solution becomes turbid. It still might be accomplished with a salt soluble in dilute alcohol and water, thus colouring the same, but insoluble in absolute alcohol and chemically inert toward it.

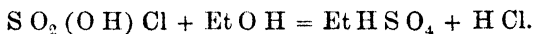
The test is a very simple one. About 4 c.c. of alcohol are placed in a test-tube, and a crystal of permanganate, $KMnO_4$, is added when—in case of the presence of water—the coloration will show at once. For observation the test glass is held on a white sheet of paper. A chemical reaction—oxidation of the alcohol, probably accompanied by the formation of an ether—ensues, but is much slower in the dark than when exposed to light.

Methyl and Ethyl Sulphates. P. Claesson. (*Journ. prakt. Chem.* [2], xix., 231–265. From *Journ. Chem. Soc.*) The method adopted for the preparation of methyl and ethyl sulphates by the author is that employed by Baumstark (*Annalen*, xli., 78) and by Orłowsky (*Ber.*, viii., 332), viz., the action of sulphuric monochloride on methyl or ethyl alcohol. The results obtained do not, however, corroborate those of the two chemists cited. According to Baumstark, sulphuric monochloride acts violently on ethyl alcohol, with separation of carbon and production of ethyl sulphate and ethyl-hydrogen sulphate. The author concludes from his own experiments that Baumstark's sulphuric monochloride really consisted of pyrosulphuric chloride, containing considerable quantities of phosphorous chloride, or perhaps phosphorous oxychloride. In addition to the work of Orłowsky already referred to, a paper was published by Mazurowska (*Journ. prakt. Chem.* [2], xiii., 158). These papers

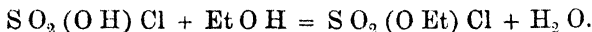
are severely criticised by the author; he believes them to have been written by the same chemist. According to Orlowsky-Mazurowska, the action of sulphuric monochloride on ethyl alcohol may be thus formulated: $2 \text{Et O H} + \text{S O}_2 (\text{O H}) \text{Cl} = \text{Et}_2 \text{S O}_4 + \text{H Cl} + \text{H}_2 \text{O}$. The normal ethyl sulphate is decomposed by water, according to the same authority; hence in this reaction a portion of the normal sulphate must have been decomposed. The properties ascribed by Orlowsky-Mazurowska to ethyl sulphate are not characteristic of that substance when pure; the compound examined by him probably contained sulphuric, phosphoric, and hydrochloric acid, and methyl chlorosulphonate. If pure methylic alcohol be allowed to drop slowly into sulphuric monochloride surrounded by ice, an energetic action takes place, with production of methyl-hydrogen sulphate and hydrochloric acid, thus:—



No water is formed during the reaction. If the acid be added to the alcohol, the same reaction occurs, but a portion of the hydrochloric acid reacts with the alcohol, producing methylechloride and water, which latter substance again decomposes some of the sulphuric monochloride, with formation of hydrochloric and sulphuric acids. An analogous action occurs when ethyl alcohol is slowly added to sulphuric monochloride,—



If the temperature be allowed to rise during the action, a considerable amount of ethyl chlorosulphonate is produced,—



The production of ethyl (or methyl) hydrogen sulphate by the action of concentrated sulphuric acid on ethyl (or methyl) alcohol is well known. The author's experiments confirm those of Berthelot (*Bull. Soc. Chim.* [2], xix., 295), viz., that when equal molecules of acid and alcohol are employed from 57 to 59 per cent. of ethyl (or methyl) hydrogen sulphate are obtained. Employment of a greater quantity of either acid or alcohol increases the yield of acid salt; the maximum amount (77 per cent.) is obtained by using 3 molecules alcohol to 1 molecule sulphuric acid.

Pure methyl-hydrogen sulphate is an oily liquid, which does not solidify at -30° ; it is soluble in absolute ether. When it is diluted with water much heat is evolved, pointing to the formation of definite hydrates, but none of these could be obtained in the form

of crystals, as stated by Dumas and Peligot (*Ann. Chim. Phys.*, lviii., 54); it seems also to form molecular compounds with methyl alcohol. When methyl hydrogen sulphate is heated to 130–140° in a vacuum, it is decomposed in accordance with the equation—



Methyl sulphate has been described by Dumas and Peligot (*loc. cit.*). Their observations are confirmed by the author; he, however, differs from these chemists as to the odour of this substance. Methyl sulphate undergoes partial decomposition when repeatedly distilled under ordinary atmospheric pressure; when heated to a high temperature with water or methyl alcohol, it is decomposed, with formation of methyl-hydrogen sulphate and methyl alcohol or ether.

The properties of ethyl hydrogen sulphate are analogous to those of the methyl compound; it is decomposed on distillation, with production of ethyl sulphate and sulphuric acid, but carbon is simultaneously separated, and sulphurous anhydride is evolved.

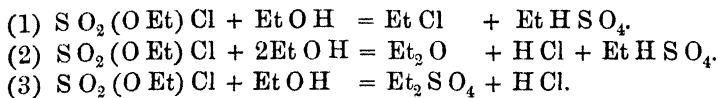
Ethyl sulphate can also be prepared by the action of ethyl alcohol on ethyl chlorosulphonate (see *post*), and by heating silver sulphate and ethyl iodide with a little alcohol and absolute ether in sealed tubes at 150°. This compound is, however, most easily obtained by mixing absolute alcohol (surrounded by ice) and sulphuric acid in molecular proportion, diluting with water, and extracting with chloroform.

Ethyl sulphate is a colourless oily liquid, of pleasant odour; it boils at 208° under ordinary atmospheric pressure, with slight decomposition; it may be distilled unchanged in a vacuum; sp. gr. at 19° = 1.1837. Ethyl sulphate is insoluble in water, but is very slowly decomposed thereby, with production of ethyl-hydrogen sulphate, and ethyl alcohol. In the presence of much water and at high temperatures, this decomposition proceeds more rapidly.

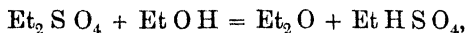
The so-called ethyl sulphate obtained by Wetherill (*Annalen*, lxi., 117) by the action of gaseous sulphuric anhydride on ether or alcohol has been examined by the author, who confirms Erlenmeyer's result (*Annalen*, clxii., 382), that this oil is a mixture of ethyl sulphate and ethyl isethionate (ethyl ethoxysulphonate), $\text{Et O. S O}_3 \text{ Et}$. If absolute ether, free from alcohol, be employed in Wetherill's process, the main product of the action is ethyl sulphate.

It has been already mentioned that ethyl sulphate may be prepared by the action of ethyl alcohol on ethyl chlorosulphonate.

The mutual action of these bodies is very energetic; it may be represented by the following equations:—



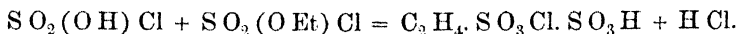
It is possible that the ether is produced by a secondary reaction between ethyl sulphate and alcohol,—



and not by the direct reaction formulated in (2).

Behrend (*Ber.*, ix., 1334) represents the action of ethyl alcohol on methyl chlorosulphonate, or of methyl alcohol on the corresponding ethyl salt, as yielding methy-ethyl sulphate, Me Et S O_4 . These results are pronounced by the author to be altogether incorrect.

In preparing ethyl chlorosulphonate by the action of ethylene on sulphuric monochloride, a dark coloured residue remained in the retort. By dissolving this residue in water, neutralizing with barium carbonate, decolorizing by filtration through animal charcoal, and precipitating by addition of alcohol, a mass of crystals was obtained which, on purification and analysis, proved to be *barium ethionate*, $\text{C}_2 \text{ H}_2 \cdot \text{O S O}_3 \cdot \text{S O}_3 \text{ Ba}$. As isethionic acid is easily prepared from barium ethionate, the action of ethylene on sulphuric monochloride affords a most ready method for the preparation of the former acid. Probably ethionic acid is produced by the action of sulphuric monochloride on previously formed ethyl chlorosulphonate. Thus:—



On adding water, the chlorothionic acid is decomposed.

The author has repeated the experiments of Gerhardt (*Traité de Chimie Organique*) on the effect of boiling a solution of barium ethyl sulphate, which led that chemist to believe in the existence of *parathionic acid*, an acid isomeric with ethyl-hydrogen sulphate. Gerhardt's barium salt probably contained a little ethyl sulphate, the presence of which would account for the reaction obtained. In the author's opinion, parathionic acid does not exist.

Action of Chlorinated Lime on Ethyl Alcohol. R. Schmitt and Goldberg. (*Journ. prakt. Chem.* [2], xix. 393). A mixture of one part of absolute alcohol and four or five parts of chlorinated lime becomes spontaneously heated in about ten minutes, when aldehyde, acetal derivatives, unaltered alcohol and a greenish

yellow oil distil over. The latter is probably ethyl-hypochlorite it is rapidly decomposed under the influence of light with the evolution of hydrochloric and hypochlorous acids and the formation of a heavy oil, insoluble in water, which on fractional distillation yields various chlorinated compounds boiling below 77°C ., besides mono- and di-chloroacetal, and a compound, probably a chlorinated ethyl-methyl ether, which boils at $77\text{--}78^{\circ}\text{C}$.

Preparation of Nitromannite. N. Sokoloff. (*Ber. der deutsch. chem. Ges.*, xii., 698.) Five parts of cold nitric acid of 1.5 sp. gr. are gradually added with continual stirring to one part of mannite. The solution is transferred to a vessel surrounded by cold water, and well mixed with ten parts of sulphuric acid. The mass is now collected on a filter, thoroughly washed with water and subsequently with solution of soda, to remove every trace of acid, and then repeatedly crystallized from alcohol. It forms long white needles, fusing at 113°C . and having a sp. gr. of 1.604 at 0°C . The sp. gr. of the fused compound is about 1.5. When thrown on coals it melts and then explodes. It can be cut or rubbed in a wedgewood mortar without danger, but it explodes violently when struck with a hammer.

Hydrocellulose. A. Girard. (*Comptes Rendus*, lxxxviii. 1322.) This substance is formed when cellulose is exposed to the action of gaseous hydrochloric, hydrobromic, hydriodic, or hydrofluoric acid, or to the vapours of sulphuric or nitric acid, in all instances in the presence of moisture. The more porous the form of cellulose used, the more quickly it is converted into hydrocellulose. The presence of moisture is an indispensable condition of the reaction, for if both cellulose and acid are perfectly dry, no formation of hydrocellulose takes place.

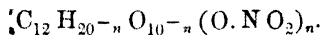
A previous notice of this body will be found in the *Year-Book of Pharmacy* for 1877, p. 100.

The Composition of Pyroxylin. J. M. Eder. (From *Ber. der deutsch. chem. Ges. New Remedies*, May, 1880.) The author first gives a list of the different formulæ assigned to pyroxylin, whether soluble in ether-alcohol, glacial acetic acid, etc., or not, and points out that the statements of the different observers are so contradictory as to be irreconcilable. A great many text-books, or books of reference, divide pyroxylin into trinitrocellulose ($\text{C}_6\text{H}_7\text{O}_5(\text{N O}_2)_3$), or gun-cotton proper (as an explosive), and dinitrocellulose ($\text{C}_6\text{H}_8\text{O}_5(\text{N O}_2)_2$), or collodion cotton; but this division is without any foundation in fact. The author maintains the view that pyroxylin is *not* a nitro-compound, but a derivative of nitric acid,

containing the group N O_3 . The different pyroxylin's obtained by the author are the following :—

Cellulose-hexanitrate,	$\text{C}_{12} \text{H}_{14} \text{O}_4 (\text{N O}_3)_6$
„ -pentanitrate,	$\text{C}_{12} \text{H}_{15} \text{O}_5 (\text{N O}_3)_5$
„ -tetranitrate,	$\text{C}_{12} \text{H}_{16} \text{O}_6 (\text{N O}_3)_4$
„ -trinitrate,	$\text{C}_{12} \text{H}_{17} \text{O}_7 (\text{N O}_3)_3$
„ -dinitrate,	$\text{C}_{12} \text{H}_{18} \text{O}_8 (\text{N O}_3)_2$

All of these compounds are decomposed by alkalis, with the elimination of nitrates. The simultaneous production of nitrites is no proof of the existence of the nitro-group N O_2 . They yield, even in the cold, nearly all their nitrogen in form of nitrates (free from nitrogen tetroxide), when treated with sulphuric acid. Towards ferrous sulphate and chloride they behave exactly like other nitrates. On decomposing pyroxylin with sulphuric acid over mercury, it yields, like any other nitrate, all its nitrogen, in form of nitric oxide. Reducing agents convert pyroxylin into ordinary cotton. Hence all pyroxylin's are constructed after the formula—



The first of the above-named compounds, the cellulose-hexanitrate, is insoluble in ether-alcohol, and constitutes *gun-cotton* properly so called; the other five pyroxylin's are all soluble in ether-alcohol, and constitute *collodion cotton*. A mononitrate could not be prepared by the author, although he varied the proportions in all possible ways.

Preparation of the various kinds of Pyroxylin :

1. *Gun-cotton proper*, or cellulose-hexanitrate.—Cotton, dried at 100°C ., is, after cooling, introduced into a mixture, cooled to about 10°C ., of 3 volumes concentrated sulphuric acid, sp. gr. 1.845, and 1 volume nitric acid, sp. gr. 1.500. No more cotton must be introduced than can be easily and completely immersed. With frequent stirring and kneading the cotton is left to macerate for twenty-four hours. It is then taken out, pressed, thrown into a large excess of water, washed by squeezing until it ceases to feel hot, then soaked for several days in frequently renewed water, and finally washed with hot water.

100 parts of cotton yield 175 to 180 parts of gun-cotton. This pyroxylin contains a small amount of lower grade, which is soluble in ether-alcohol, and may be extracted by the latter.

2. *Collodion cotton*.—It is not possible to *exactly* predict the kind of pyroxylin obtained by an operation; yet by carefully

observing the strength and proportion of the acids, very close results may be obtained. If the acids are as concentrated as possible, the hexanitrate (gun-cotton proper) is mostly produced; if the acids were two dilute, some tetranitrate is present, and the whole product is soluble in ether-alcohol.

The pentanitrate, however, may be prepared almost entirely pure by dissolving pyroxylin in warm nitric acid and precipitating the clear solution by an excess of sulphuric acid. The best way is to introduce the pyroxylin into nitric acid, sp. gr. 1.400, at a temperature of 40–60° C., until the solution acquires a strongly yellow colour. The turbid solution is then allowed to cool, and this is promoted by ice, to prevent the generation of red vapours, which, once begun, would destroy the product. The solution, after being filtered through asbestos, is precipitated by four times its volume of sulphuric acid, sp. gr. 1.840.

The *tetranitrate* and *trinitrate*, which are the most soluble forms of collodion cotton, are generally produced together, if the acids were not too concentrated, and were sufficiently warm. A product consisting mostly of the *tetranitrate* is produced by treating cotton with a mixture of 1 vol. of sulphuric acid, sp. gr. 1.845, and 1 vol. nitric acid, sp. gr. 1.380 at 65° C., for fifteen minutes. A trifle less nitrogen is contained in the product obtained by treating cotton with equal volumes of sulphuric (1.845) and nitric (1.400) acids, at 80° C. for fifteen minutes. Schering's collodion cotton has the composition of the tetranitrate.

Essential Oil of Marjoram. G. Bruylants. (*Journ. Chem. Soc.*, from *Journ. de Pharm.* [4], xxx., 33–35.) Oil of marjoram, obtained by distilling the flowery tops of *Origanum Marjorana* in a current of steam, is a yellowish liquid when freshly prepared (sp. gr. 0.911 at 15°), but becomes brown on standing. It has a pungent smell, and a hot, peppery, and slightly bitter taste. It is dextrorotatory, and has an acid reaction. When distilled, it begins to boil at 185°, but the temperature rapidly rises to 200°, and remains constant between 215–220°, a resinous mass being left in the retort.

By repeatedly fractioning the oil which passes over at 185–190°, a portion is obtained, boiling between 160–162°, consisting principally of a terpene.

The fraction boiling at 215–220° yields no portion having a constant boiling point, nor does it deposit crystals when cooled to –25°. Its vapour density and analysis correspond with either laurel camphor or borneol. When distilled with phosphoric anhydride, it yields a mixture of cymene and a terpene (b. p. 160–170°). When

treated with acetic anhydride, it forms a compound (b. p. 230–235°), which with alcoholic potash yields terpene and potassic acetate. Chromic acid oxidizes it with the formation of acetic and formic acids, and laurel camphor.

Oil of marjoram is therefore composed of a dextrorotary hydrocarbon, 5 per cent.; a mixture of dextrorotatory camphor and borneol, 85 per cent.; resin, 10 per cent.

Oil of Lavender. G. Bruylants. (From *Journ. de Pharm.* [4], xxx., 139.) Oil of lavender, when freshly prepared, is a colourless liquid, which becomes yellow on standing; it smells of lavender, and its taste is hot, camphorous, and slightly bitter. It is lævorotatory, has an acid reaction, and sp. gr. 0.875 at 15°. It begins to boil at 185°, the temperature quickly rises to 190°, and the greater portion distils over between 195–215°. The first portion of the distillate consists of a mixture of acetic and formic acids, but contains no valeric acid. By repeated fractionation, a lævorotatory terpene (b. p. 162°) is separated, capable of forming a crystalline hydrochloride. The oil also contains a mixture of camphor and borneol: this mixture forms an acetate (b. p. 230°), which is decomposed by potash, yielding a terpene and potassium acetate. When it is distilled with phosphoric anhydride, a hydrocarbon is obtained, consisting for the most part of terpene, and containing also some cymene. Oil of lavender consists of terpene, 25 per cent.; borneol ($\frac{1}{3}$), and camphor ($\frac{1}{3}$), 65 per cent.; resin, 10 per cent.

Essential Oil of Spike. G. Bruylants. (From *Journ. de Pharm.* [4], xxx., 141.) This oil, obtained from *Lavandula aspicula latifolia*, is a colourless liquid, which in time thickens and darkens in colour. It has an acid reaction, and sp. gr. 0.9081 at 15°. Its odour resembles that of lavender. Its composition is almost identical with that of oil of lavender, but as it contains more hydrocarbon, it begins to boil at 170–175°. It is lævorotatory. Its composition is as follows:—Terpene, 35 per cent.; borneol and camphor, 55 per cent.; resin, 10 per cent.

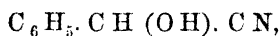
Oil of Rosemary. G. Bruylants. (*Journ. de Pharm.* [4], xxix., 508.) This oil contains 80 per cent. of a lævogyrate terpene, $C_{10}H_{16}$, 6 to 8 per cent. of a camphor, $C_{10}H_{16}O$, and 4 to 5 per cent. of a borneol camphor, $C_{10}H_{18}O$. Treated with sulphuric acid the oil yields a mixture of cymene and terpene. Among the oxidation-products obtained by the action of potassium bichromate and sulphuric acid are formic, acetic, and terephthalic acids, and a small quantity of camphor.

The Volatile Oil of Myroxylon Peruiferum. Dr. T. Peckolt.

(*Zeitschr. des oesterr. Apoth.-Ver.*, 1879, 441.) This is a colourless or slightly yellowish oil, neutral to test paper, of a pleasant aromatic odour, and hot aromatic taste, and having a sp. gr. of .892 at 13° C. Concentrated fuming nitric acid converts it into a dark purple soft resin, which after washing with water and drying is brown and brittle, and insoluble in cold but soluble in boiling alcohol. With a mixture of nitric and sulphuric acids it yields a brown resinous mass of a peculiar odour somewhat resembling that of musk. When treated with sulphuric acid alone it is converted into a soft dark-brown resin of a turpentine-like odour.

Reducing Action of Oil of Cloves. Prof. Böttger. (From *Chemiker Zeitung*.) Oil of cloves, when dropped on dry silver oxide, silver dioxide, or oxide of gold, energetically reduces the oxide to the metallic state, and evolves a sufficient amount of heat to ignite the oil. If the oil be deprived of its eugenic acid, it no longer possesses this reducing power.

Chemical Nature of the Essential Oil of Cherry-Laurel and of Bitter Almonds. M. Fileti. (*Gaz. Chim. Ital.*, viii., 454-462. From *Journ Chem. Soc.*) The great difficulty of separating the whole of the hydrogen cyanide from essence of bitter almonds, and of the cherry-laurel, renders it probable that it is present in some form of combination with the benzaldehyde; this compound would form the nitril,



corresponding with mandelic acid. In order to test the truth of this supposition, the crude essences were treated with zinc and hydrochloric acid, in presence of alcohol and a platinum plate; twenty-four hours afterwards, the mixture was precipitated with water, and evaporated at 100° to remove alcohol. After filtration from the hydrobenzoin, the liquid was supersaturated with potash, and agitated with ether, the ethereal solution being subsequently washed with water, and agitated with dilute hydrochloric acid. On evaporating the acid solution, the hydrochloride of a base was obtained, which was converted into the platino-chloride and analysed, as was also the hydrochloride. The results correspond with the formula $\text{C}_6\text{H}_5\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{N}\cdot\text{H}_2$ for the base. From this it would appear that the nitril, $\text{C}_6\text{H}_5\cdot\text{CH}(\text{OH})\cdot\text{CN}$, is present in the crude essences, and that by the action of nascent hydrogen it is not converted into the amide, $\text{C}_6\text{H}_5\cdot\text{CH}(\text{OH})\cdot\text{CH}_2\cdot\text{N}\cdot\text{H}_2$, as might have been expected, but that an atom of oxygen is eliminated in the process, so that the final product is the base $\text{C}_6\text{H}_5\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{N}\cdot\text{H}_2$.

A mixture of pure benzaldehyde and hydrogen cyanide, when treated with zinc and hydrochloric acid in a similar manner, yields a base having the composition and properties of methylamine.

In a similar manner, both chlorine and fuming sulphuric acid act differently on the essences to what they do on a mixture of pure benzaldehyde with hydrogen cyanide. With the crude essence, a solid crystalline substance is formed, which Zinin has shown to be benzylideneformobenzamide, $\text{SH} \cdot \text{CH}(\text{OH}) \cdot \text{CO} \cdot \text{N} : \text{CH} \cdot \text{PH}$; whilst the author finds that no solid substance is produced by the action of fuming sulphuric acid on the mixture, and with chlorine it yields ammonium chloride and monochlorobenzoic chloride.

The base above described is obtained in much larger quantity by the action of zinc and hydrochloric on amygdalin in aqueous solution. The hydrochloride of the base is more soluble in water than in alcohol, crystallizing from the latter in large plates, melting at 217° , and subliming near its fusing point. It would appear to be identical with that obtained by Colombes and Spica, by the action of nascent hydrogen on the compound of benzyl cyanide with hydrogen sulphide (*Gaz.*, v., 124). On decomposing the solution of the hydrochloride with potash, agitating with ether, and leaving the ethereal solution to evaporate, the free base is obtained as a syrupy liquid, which after a time crystallizes in large plates (m. p. $101-104^\circ$). The author proposes to continue his examination of the more obscure reactions of the essences of bitter almonds and cherry laurel.

Tests for the Purity of Volatile Oil of Mustard. Dr. H. Hager. (*Pharm. Centralhalle*, 1879, 361.) 1 gram of the oil when heated in a shallow dish to $40-50^\circ \text{C}$., for two hours, should leave no residue, showing the absence of fatty oils, phenol, oil of cloves, oil or mirbane, etc.

When dropped into cold water, the oil should sink and remain clear. A cloudy or milky appearance of the drops point to the presence of alcohol or amylic alcohol.

10 drops of the oil should form a colourless or almost colourless mixture with 5 c.c. of pure sulphuric acid.

A solution of 10 drops of the oil in 4 c.c. of pure absolute alcohol, when mixed with 2 to 3 c.c. of strong solution of ammonio-sulphate of copper (prepared by adding ammonia to a saturated aqueous solution of copper sulphate until the precipitate is re-dissolved), produces an ultramarine-blue precipitate, which should not change its colour. In the presence of a trace of carbon bi-sulphide, the precipitate turns first violet-brown, and then gradually changes to

reddish brown. The presence of amyl alcohol, phenol, or oil of cloves would also cause a change of colour.

Carbolic acid is best detected by shaking the oil with water for some time, allowing to stand for about 15 minutes, filtering, and testing the filtrate with a few drops of solution of ferric chloride, which, in the presence of the adulterant will produce a blue coloration.

Compounds of the Terpenes with Hydrochloric Acid. Dr. W. A. Tilden. (*Journ. Chem. Soc.*, Nov. 1879, 943.) When dry hydrogen chloride is passed into cooled turpentine-oil (b. p. 156°), the well-known solid terpene mono-hydrochloride, $C_{10}H_{17}Cl$, melting at 125° and boiling at about 210° , is produced, together with a liquid substance which is a mixture of the mono- and di-hydrochlorides, and found in company with cymene, which is always present in turpentine oil. The author verifies the observation of Berthelot, that the mono- and di-hydrochlorides of terpene combine and become liquid, and doubts the existence of a liquid mono-hydrochloride.

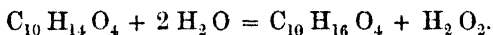
If turpentine oil be dissolved in benzene or carbon bisulphide, and dry hydrogen chloride passed through the mixture, the solid mono-hydrochloride is again produced; but if it be dissolved in a menstruum which contains either water or the elements of water, such as alcohol, ether, or acetic acid, the *di-hydrochloride*, $C_{10}H_{18}Cl_2$, is formed, and on standing is deposited as crystals which melt at 48° . The author found it impossible to convert the mono- into di-hydrochloride by the action of hydrochloric acid on it. These two hydrochlorides are of entirely dissimilar constitution. By the action of soda, the mono-hydrochloride is decomposed, yielding a crystalline camphene, whilst the di-hydrochloride yields chiefly terpinol, $C_{10}H_{17}(OH)$.

The di-hydrochloride may also be prepared by the action of hydrogen chloride on crystallized terpin hydrate, on terpinol, and on the alcoholic or ethereal solution of the terpenes of higher boiling points than turpentine oil, whilst the mono-hydrochloride cannot be produced from these terpenes.

The di-hydrochlorides obtained from all the different terpenes possess the same properties, with the exception of that produced from "sylvestrene," the terpene which was discovered by Atterberg in Swedish turpentine, and recognised by the author in Russian turpentine. Its crystals melt at 72° to 73° . It is decomposed by alkali, but yields a hydrate which is apparently not common terpinol; it is possible this substance may be capable of being converted into a new terpin.

By prolonged boiling with water, the di-hydrochloride is resolved into hydrochloric acid and terpinylene, $C_{10}H_{16}$, which boils at 176° , a portion of which is converted at the same time into viscid polymerides, but the terpinylene cannot again be made to combine with hydrochloric acid to form the crystalline di-hydrochloride.

The Atmospheric Oxidation of Turpentine. C. T. Kingzett. (*Journ. Chem. Soc.*, Jan., 1880, 51.) The author has shown in his previous papers that when so-called essential oils are exposed to the atmosphere, peroxide of hydrogen is indirectly produced. In turpentine oil it appears as if a camphoric peroxide, $C_{10}H_{14}O_4$, is first formed, and that in contact with water this is decomposed, yielding hydrogen peroxide and camphoric acid, thus :



While terpene, $C_{10}H_{16}$, and menthene, $C_{10}H_{18}$, give rise to peroxide of hydrogen, hydrocarbons of the formula $C_{15}H_{24}$ do not.

As all terpenes and menthene yield cymene, $C_{10}H_{14}$, and as cymene itself yields hydrogen peroxide, the author believes that there is some relation between the formation of this body and that of hydrogen peroxide, and this opinion is strengthened by the fact that the hydrocarbon from oil of cloves, $C_{15}H_{24}$, yields neither cymene nor hydrogen peroxide.

The product of oxidation which is formed by exposing turpentine to the action of the air, and which in contact with water forms hydrogen peroxide, may be produced in such quantities that when the turpentine oil containing it is heated a little above the boiling point, decomposition occurs with almost explosive violence. The atmospheric oxidation of turpentine is now carried out, on a large scale, in the manufacture of the disinfectant called "sanitas."

Different essential oils and varieties of turpentine absorb oxygen with different degrees of rapidity, and when oxidation has once commenced, the oil absorbs oxygen with increasing rapidity in proportion as the oxidation increases up to a certain point. As to the differences in this respect in different oils, the author gives the following results, deduced from experiment, by exposing the various oils under similar conditions to light and air. Assuming that the amount of oxygen absorbed by Russian oil of turpentine (which absorbs the largest amount) be represented by 100, then Swedish oil of turpentine also absorbs 100; an oil obtained from Switzerland, 89.4; American oil of turpentine, 79.9; oil of eucalyptus, 75.0; adulterated Swedish turpentine, 52.6; "Scotch distilled American turpentine, 42.1.

The two last-mentioned oils were presumed to be adulterated with so-called pine-oil of commerce. When these oils are placed in cylinders, the mouths of which are covered with papers saturated with a mixture of potassic iodide and starch, the papers become coloured in the order given above, owing to the formation of different quantities of hydrogen peroxide in the vicinity of each.

When the aqueous solution obtained by blowing air through a mixture of turpentine and water ("sanitas"), is evaporated to dryness on a steam-bath, the hydrogen peroxide contained in it is decomposed, the acetic acid is expelled, and there remains a dark coloured matter, which when hot is viscid, and has a sugar-like odour, but on cooling sets to an adhesive but firm mass; when treated with sulphuric acid it gives a colour reaction somewhat resembling that bearing Pettenkofer's name. This adhesive mass, which was slightly volatile at 100° , after drying gave numbers corresponding with the formula $C_{10}H_{18}O_3$. It has remarkable antiseptic properties, to which the similar properties of "sanitas" are largely due.

About 95 per cent. of this adhesive matter is soluble in water, forming a yellowish brown solution, from which charcoal failed to remove the colour, although it absorbed a considerable proportion of the substance itself. This solution on evaporation to dryness left a transparent varnish-like substance, semi-fluid when hot, and volatile at 100° . From analysis, the formula $C_{10}H_{18}O_3$ was calculated.

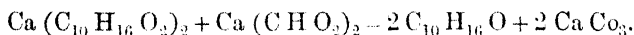
The 5 per cent. of the original adhesive substance which was insoluble in water did not give the vivid reaction with sulphuric acid which the soluble portion did; this insoluble matter is soluble in presence of an oily substance which the original aqueous solution contained, and which was expelled on evaporation.

On submitting the soluble portion to distillation, it melted, boiled, and a small quantity of an almost colourless oil passed over, which on cooling became a colourless, soft, crystalline mass; this was followed by a permanent oil, which became darker as the distillation proceeded; towards the end the vapour in the retort had a green colour, and a pitch was left. None of these products have as yet been further examined.

On acidulating the solution of the soluble portion, $C_{10}H_{18}O_3$, with dilute sulphuric acid, it becomes milky, and on standing, a slightly coloured oily body separates in considerable quantity. The author hopes that a study of this substance will throw light, not only on the constitution of the soluble substance, but also on that of the terpenes as a class.

The aqueous solution ("sanitas") obtained by oxidizing Russian turpentine, when neutralized with soda, darkens very much in colour, and on evaporation of the mixture at 100° , a soft resin-like residue is left. On treating this with dilute sulphuric acid, it yields a dark oily mass; the clear acid solution is filtered and subjected to distillation; as it becomes hot more oil separates out, and an acid distillate passes over, together with 20 or 30 c.c. of a slightly yellow oil with an odour resembling that of mixed cymene and eucalyptus. At the end of the distillation a quantity of tarry-looking matter remains in the retort floating on the acid solution. The acidity of the distillate was found to be due to acetic acid, which amounted to about 0.25 gram per litre of the aqueous solution ("sanitas"), and no other volatile acid could be detected. The author anticipates that the further study of those compounds will be attended with very important and interesting results, inasmuch as they have the advantage of having been produced by the mildest possible oxidation.

Conversion of Camphic Acid into Camphor. J. de Montgolfier. (*Comptes Rendus*, lxxxviii., 915.) By heating the calcium salt of camphic acid with calcium formate the author obtained camphor and calcium carbonate in accordance with the following equation:—



The most abundant product of the reaction is a liquid boiling at $230\text{--}235^{\circ}\text{C.}$, in which the resulting camphor remains dissolved.

Synthetical Formation of Formic Acid. O. Loewe. (*Ber. der deutsch. chem. Ges.*, xiii., 304.) Carbon bisulphide when heated with water and iron filings in sealed tubes at 100°C. , yields formic acid, along with formate and sulphide of iron, carbonic anhydride, and trithiomethylene.

Action of Bromine on Acetic Acid. C. Hell and O. Mühlhäuser. (*Ber. der deutsch. chem. Ges.*, xii. 735.) When equal molecular weights of bromine and acetic acid are heated in sealed tubes at 100°C. , hydrobromic acid is formed, and a crystalline compound of the formula, $(\text{C}_2\text{H}_4\text{O}_2, \text{Br}_2)_4\text{HBr}$. The quantity of hydrobromic acid thus produced increases in geometrical progression with the number of hours for which the heat is applied.

Test for the Purity of Glacial Acetic Acid. M. Bardy. (*Moniteur Scientifique*, Aug., 1879.) The author finds that commercial glacial acetic acid is a very variable article containing from 87 to 99.5 per cent. of actual acid. The test recommended by him

is based on the solubility in the acid of oil of turpentine. 1 volume of the acid is shaken with 8 to 10 volumes of the oil. If the mixture remains clear the strength of the acid is at least 97 per cent.; if it is not clear the acid should be rejected. Samples containing above 99·5 of real acid dissolve the oil in any proportion.

Destructive Action of Wood on Salicylic Acid. H. Kolbe. (*Journ. prakt. Chem.* [2], 443.) Water containing ·1 gram of salicylic acid per litre remains quite fresh for twelve months when kept in a glass vessel. When kept in a wooden cask, however, the water becomes bad and the salicylic acid completely disappears, so that it cannot be detected either in the water or wood. The same destruction of salicylic acid occurs if wine be used instead of water.

Solubility of Benzoic and Salicylic Acids in Water. M. Bourgoin. (*Chem. and Drug.*, Nov., 1879, from *Répertoire de Pharm.*) The author has determined the solubility of the above acids in water at temperatures from 0° to 100° C. A litre, or 1000 cubic centimetres of water, at the temperature in the first column, will dissolve the quantities in grams of salicylic and benzoic acids in the second and third columns respectively.

Temperature Centigrade.	Salicylic Acid.	Benzoic Acid.
0° . . .	1·50 . . .	1·70
5° . . .	1·65 . . .	1·85
10° . . .	1·90 . . .	2·10
15° . . .	2·25 . . .	2·45
20° . . .	2·70 . . .	2·90
30° . . .	3·90 . . .	4·10
50° . . .	8·00 . . .	7·75
60° . . .	12·25 . . .	11·55
70° . . .	19·90 . . .	17·75
80° . . .	32·55 . . .	27·15
90° . . .	51·80 . . .	40·75
100° . . .	79·25 . . .	58·75

Cause of the Reddening of Carbohc Acid. Dr. H. Hager. (*Pharmaceut. Centralh.*, 1880, 77.) The author attributes the reddening of carbohc acid to the access of air containing ammonia or ammonium nitrite.

Fusion of Aromatic Acids with Soda. L. Barth and J. Schreder. (*Ber. der deutsch chem. Ges.*, xii., 1255. From *Journ. Chem. Soc.*) By fusing aromatic acids with eight to ten times their weight of soda, the carboxyl group is first eliminated, and in some cases the products undergo further reactions.

Benzoic acid thus treated yields water and benzene—about 70–80

per cent. of the theoretical yield. A small quantity of diphenyl is formed, probably owing to the contact of the benzene vapours with the hot sides of the retort.

Trimellitic and hydrocinnamic acids yield the same products as benzoic acid. Cinnamic acid yields benzene chiefly (over 50 per cent.), and a small quantity of a high boiling oil, probably styrene.

Salicylic acid when heated at $340\text{--}355^\circ$ is converted into phenol about (50 per cent.), which remains in combination with the alkali along with some unaltered salicylic acid. A better yield is obtained by heating it higher and conducting the operation more quickly.

Hydroxybenzoic acid is decomposed at 360° , and yields a smaller quantity of phenol, since a large proportion of the acid is completely oxidized. Parahydroxybenzoic acid yields similar results. In both these last two cases small quantities of salicylic acid were formed.

Protocatechuic acid is decomposed slowly between 330° and 350° forming pyrocatechol, which contains some of the unaltered acid.

Dihydroxybenzoic acid decomposes a little above 350° , yielding 80–85 per cent. of the theoretical quantity of resorcinol, together with traces of condensation-products. From this it follows that this acid has a symmetrical constitution. In some experiments the formation of phloroglucinol was observed, which is doubtless formed from resorcinol.

α -Dihydroxybenzoic acid prepared by Brunner from toluene-disulphonic acid, and probably identical with the 1, 2, 4 dihydroxybenzoic acid of Ascher, yields according to Senhofer at 286° as much as 60 per cent. of resorcinol. Its barium salt yields the same product when distilled with pumice stone.

Gallic acid is only partially and but slowly decomposed at 340° , pyrogallol and a small quantity of hexhydroxydiphenyl being formed. Owing to oxidation there is a considerable loss.

Phloretic acid requires a temperature above the boiling point of mercury, and at a certain stage yields parahydroxybenzoic acid, which by further fusion yields phenol.

Hydroparacoumaric acid is scarcely decomposed at 340° ; if heated more strongly and for a short time, it is resolved into acetic and parahydroxybenzoic acids and phenol.

Paracoumaric acid is decomposed between 300° and 340° , yielding parahydroxybenzoic acid, which latter decomposes at a higher temperature and yields phenol.

Hydroxyterephthalic acid is resolved at 340° into carbonic acid and a mixture of salicylic and hydroxybenzoic acids, which by further fusion yield phenol.

Methylerotonic and Angelic Acids. Dr. E. Schmidt. (*Ber. der deutsch. chem. Ges.*, xii., 252-258. From *Journ. Chem. Soc.*) Having proved the identity of tiglic acid from croton oil with Frankland and Duppa's methylerotonic acid, the author has endeavoured to ascertain the constitution of the isomeric angelic acid. The attempt to prepare this latter acid by abstracting water from hydroxyisobutylformic acid did not succeed (*Annalen*, exciii., 87); and he has therefore tried to convert it by reduction into some known variety of valeric acid. This conversion has been already effected by Ascher (*Ber.*, ii., 685); but he did not succeed in determining the precise nature of the resulting acid.

Demarçay (*Comptes Rendus*, lxxxiii., 906) has observed that heat converts angelic into methylerotonic acid, and the author has found that the same change is effected by time alone. A specimen of angelic acid which had been preserved for twenty-five years, although retaining the outward appearance of that acid, was found to consist of pure methylerotonic acid. The latter, by reduction, yields methylethylacetic acid with great ease; and the author's experiments show that the same body is obtained on the reduction of angelic acid.

Neither of the isomerides unites *directly* with nascent hydrogen. Hydriodic acid at 160° easily converts methylerotonic into methylethylacetic; but this process does not succeed well with angelic acid. With bromine, the two acids give the same addition-product, $C_5H_8Br_2O_2$, melting at 64° (Pagenstecher, *Annalen*, excv., 198); and this compound, when reduced either by sodium amalgam or by zinc and sulphuric acid, always gives methylerotonic acid. According to Pagenstecher, also, the same *bromovaleric acid* is produced by adding hydrobromic acid to both acids.

The addition-products with hydriodic acid are, however, different. They are best obtained by introducing the finely-powdered acids into hydriodic acid of 1.96 sp. gr., cooling to 0°, and saturating with hydriodic acid gas at that temperature. After the lapse of some hours, the new acids separate. *Hydriodo methylerotonic acid* crystallizes in fine brilliant plates (m. p. 86.5°); *hydriodo angelic acid* separates in compact prisms (m. p. 46°), but it is evidently contaminated with some other, probably isomeric, acid. If angelic acid is treated with a weaker acid than the above, a mixture of the two hydriodo-acids is produced.

To avoid intramolecular changes, both acids were crystallized at ordinary temperatures: the first from ether, the second from water, in a vacuum. Nevertheless, both yielded by reduction with zinc

and sulphuric acid the same product, *methylethylacetic acid*, boiling at 173–175°. No difference could be detected between the acids from the two sources, or their salts. Both give methylcrotonic acid when decomposed by silver nitrate.

In its whole behaviour, angelic acid distinctly resembles β -crotonic acid; but whether it is a derivation of that acid, $\text{CH}_3 : \text{CH} . \text{CH} . (\text{CH}_3) . \text{COOH}$, or of methyl- α -crotonic acid, $\text{CH}_3 : \text{C} (\text{CH}_3) \text{COOH}$, has yet to be decided. Either formula would explain its reactions.

Estimation of Tannin in Sumach Leaves. H. Macagno. (*Chem. News*, xli., 63.) Take 10 c.c. of a decoction of sumach, acidify with sulphuric acid, add some water, and titrate with permanganate of potash. From 100 c.c. of the same tannin extract precipitate the tannic acid with ammoniacal acetate of copper, taking care that there is an excess of ammonia, and filter. The first few drops of filtrate are rejected, and then 10 c.c. of the filtrate are to be acidified with sulphuric acid, diluted, and titrated with permanganate. The number of cubic centimetres of permanganate destroyed by the solution, from which the tannin has been separated, subtracted from that required before removal of the tannin, gives the quantity of permanganate which has been required to oxidize the tannic acid. The analyses were made separately on the leaves of the lower and superior sides of branches, and the results per cent. are as follows:—

	Water in Leaves.		Tannin in Leaves.		Mean Results.	
	Superior Side.	Lower Side.	Superior Side.	Lower Side.	Water.	Tannin.
June 10, 1879	58.15	60.23	24.93	17.45	59.19	21.19
" 16 "	57.12	63.40	24.92	16.11	60.30	20.51
" 27 "	52.47	63.44	25.82	15.27	57.95	20.54
July 14 "	51.15	62.24	24.75	10.81	56.69	17.78
" 29 "	49.80	60.33	23.80	9.44	55.06	16.62
Aug. 11 "	48.15	61.80	21.91	8.77	54.97	15.34

An unknown and interesting fact shown by these results is the greater quantity of tannin in the leaves of the superior side of branches, and also the decided decrease of this constituent with the further growth of sumach. Notwithstanding, for commercial purposes, the cultivator will be always led to retard the crop, as the extra quantity of leaves compensates for the want of tannic acid.

Estimation of Tannin by means of Cinchonine. Dr. Ostermayer. (From *Pharmaceut. Zeitung*.) The test solution used by the author was made by dissolving 4.523 grams of cinchonine sulphate, .1 gram

of magenta, and .05 gram of sulphuric acid in sufficient water to make up 1 litre. This test liquid is added to the solution of tannin until the mixture begins to retain the colour of magenta. 10 grams of the substance to be tested are exhausted with boiling water, and the united decoctions filtered when cold, and evaporated to dryness. The tannin is completely extracted from the residue by repeated treatment with a mixture of 1 part of ether and 2 parts of alcohol of 90 per cent., and after again evaporating the united solutions, the residue now left is dissolved in 500 c.c. of water. Of this solution 50 c.c. are titrated with the cinchonine solution in the manner above indicated. Each c.c. of the latter thus required corresponds to 1 per cent. of tannin.

Digallic Acid. H. Schiff. (*Gaz. Chim. Ital.*, ix., 1-22. From *Journ. Chem. Soc.*) After stating that Loewe had already obtained a tannic acid which did not contain any appreciable quantity of glucose, by treating ordinary commercial tannin with ethyl acetate, and by the dialysis of an alcoholic solution of tannin previously treated with ether, the author describes a sample of tannin prepared by Schering, of Berlin, which only contained 2.7 per cent. glucose; other samples contained 3-4 per cent. The reactions of these preparations correspond exactly with those of the digallic acid obtained by the action of arsenic acid or phosphorus oxychloride on gallic acid. In his earlier papers on this subject, the author stated that the gallic acid was almost entirely converted into digallic acid by this treatment, but this he finds to be incorrect. The origin of the error is that gallic acid dissolves in large quantity in hot solution of digallic acid, and on cooling exhibits the phenomenon of supersaturation in a remarkable degree; sometimes the solution will remain for weeks without any gallic acid being deposited, and even when crystals of gallic acid are introduced, it frequently happens that days elapse before crystallization sets in. On mixing such a supersaturated solution with a solution of common salt, the greater part of the gallic acid is thrown down along with the tannic acid; moreover, if arsenic acid is present and hydrogen sulphide is passed into the solution, the crystallization of the gallic acid is induced by the arsenic sulphide which is precipitated. It would appear also that even after hydrogen sulphide has been passed into the arsenical solution for several hours, and the saturated solution has been allowed to stand for several days, the whole of the arsenic is not precipitated; this is probably due to the solubility of arsenic sulphide in aqueous solution of hydrogen sulphide, and also in solution of digallic acid.

The author states that the gallic acid and dissolved arsenic sulphide may be separated by means of ether containing a certain quantity of alcohol, and that other well known methods then serve for the final purification of the crude digallic acid thus obtained. It still, however, contains traces of arsenic.

Neither arsenic acid, nor gallic acid, nor a mixture of the two gives the characteristic reactions of tannin, but these reactions are at once obtained if the mixture is boiled for a few minutes. For instance, neither gallic acid nor a mixture of gallic with arsenic acid, precipitates quinine sulphate; whilst an abundant precipitate is obtained with digallic acid, either natural or artificial, and that whether arsenic acid is present or not.

When the solution of artificial digallic acid, prepared by the action of arsenic acid, is precipitated by hydrogen sulphide, the precipitate of sulphur and arsenic sulphide contains gallic acid, which may be separated by boiling it with water. If arsenic acid be now added to the solution of digallic acid, a precipitate of arsenic sulphide is at once produced by the dissolved hydrogen sulphide, and on passing hydrogen sulphide the remainder of the arsenic is thrown down. This precipitate, like the first, contains gallic acid, and the solution of digallic acid remaining gives the tannin reactions in a less marked manner. By repeating the treatment with arsenic acid and hydrogen sulphide, it is found that the precipitated arsenic sulphide always contains gallic acid; whilst the tannin reaction of the digallic acid solution gradually becomes feebler. The gallic acid obtained from these precipitates retains a portion of the digallic acid, and its solution shows the phenomenon of supersaturation previously noticed: large, coloured crystals of gallic acid (m. p. 235–240°: triclinic octahedrons), and small almost colourless crystals are deposited side by side from this solution. The experiment just described renders it probable that digallic acid is decomposed by excess of arsenic acid, so that it is not advisable to greatly increase the quantity of the latter, 8·10 per cent. of the gallic acid being the most advantageous proportion. In time, a comparatively small quantity of arsenic acid can convert a relatively large quantity of gallic acid into digallic acid.

Digallic acid, like natural tannin, is removed even from its dilute aqueous solution by agitation with ethyl acetate.

Preparation and Estimation of Hippuric Acid. P. Cazeneuve. (*Journ. de Pharm. et de Chim.*, April, 1879, 309.) The author prepares pure hippuric acid by the following process, which he also recommends for the estimation of this acid in urine:—

250 c.c. of urine are evaporated on a water-bath to 25 c.c., which are then mixed with 5 c.c. of hydrochloric acid and 50 grams of gypsum, and evaporated to dryness. The dried and powdered mass is repeatedly extracted with ether, the ethereal solution evaporated, the residue exhausted with boiling water, the solution filtered while hot, and then put aside in a cold place. If the temperature be sufficiently low the acid will crystallize out so completely that only a mere trace of it is left in the mother-liquor. It is not advisable to attempt a separation of this trace of acid, since the mother-liquor often contains a small quantity of urea, which might give rise to errors. Secinic acid, emanating from fermentation of the urine or from the patient's food, is left in the mother-liquor. The presence of biliary constituents or of colouring matters does not affect the process. Diabetic urine, however, must first be freed from its sugar by fermentation with yeast, as otherwise it would be difficult to properly dry up the residue and to extract from it the whole of the hippuric acid by ether.

Another method described by the author is a convenient and rapid one for the preparation of pure hippuric acid, but it is not suited for the purpose of a quantitative determination. The process is as follows:—The urine is collected after the internal administration of several grams of sodium benzoate to the patient. Chlorine gas is passed through the urine until the dark coloration at first produced is discharged and the urine appears colourless, when the hippuric acid will be found to separate in the form of colourless crystals. The urine should not be alkaline, as otherwise benzoglycollic will be formed at the expense of hippuric acid. This chlorine process also answers well for the purification of impure or coloured hippuric acid. If such acid be dissolved in hot water, and a few bubbles of chlorine gas passed through the solution, a colourless acid will crystallize out on cooling.

Berberonic Acid. H. Weidel. (*Ber. der deutsch. chem. Ges.*, xii., 410.) This acid is obtained by heating berberine with 10 times its weight of nitric acid, concentrating the resulting solution by evaporation, and allowing to crystallize. Fleitmann's statement (*Liebig's Annalen*, lix., 160) that the acid product of this oxidation is oxalic acid, is found by the author to be incorrect. Pure berberonic acid is obtained by converting the crude product into the calcium salt, decomposing this with an acid, and purifying the product by re-crystallization from hot water. It forms transparent prismatic crystals, readily soluble in hot water, but sparingly soluble in cold water and alcohol, and insoluble in ether, benzol, and chloro-

form. The crystals have a composition corresponding to the formula $C_8H_5NO_6 + 2H_2O$. On exposure to the air they part with one molecule of water, and lose their transparency. The aqueous solution gives an intense red coloration with ferrous sulphate, agreeing in this reaction with oxychinchomeric pyridene-dicarboxylic acids. The calcium salt, $Ca_3(C_8H_5NO_6)_2 + 4H_2O$, forms white shining needles, which are almost insoluble in water, and yield on distillation with lime, pyridine, together with other products. The silver salt, $Ag_3C_8H_5NO_6$, is obtained in the form of a white crystalline precipitate.

In the author's opinion, berberonic acid may be regarded as pyridene-tricarboxylic acid.

The Valerianates of Ammonium. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1879, 474.) Commercial ammonium valerianate is always the acid salt. The crystals have an acid taste and reaction, and are readily decomposed on exposure to moist air. When thrown on water these crystals exhibit a characteristic rotating motion. The neutral salt forms prismatic crystals which can be obtained, though not without difficulty, by the action of dry ammonia gas on the monohydrated acid at a low temperature. The crystals melt on the application of a gentle heat. The author regards this salt as preferable to the acid one if it is to be given in the form of a mixture, as its solution is not liable to decomposition.

The valerianates of ammonium are prescribed in doses of from 3 to 6 grains, as valuable nervine stimulants, especially in neuralgic affections.

The Purity of Cream of Tartar. Dr. B. H. Paul. (*Pharm. Journ.*, 3rd series, x., 341 and 409.) Recent discussions as to the amount of tartrate of lime existing in unadulterated cream of tartar, have induced the author to carry out some experiments with the object of determining the extent to which cream of tartar prepared in the usual way might contain lime in combination with tartaric acid.

On adding pure crystallized tartrate of lime, $CaC_4H_4O_6 \cdot 4H_2O$, to a boiling solution of bitartrate of potash, prepared by neutralizing 5 grams of tartaric acid with carbonate of potash, and then adding another 5 grams of tartaric acid, the tartrate of lime was dissolved, and after some few minutes the liquid was filtered while near the boiling point. On cooling, crystals were deposited, having all the external characters of bitartrate of potash, but on analysis the salt was found to contain a considerable amount of lime, though forming a clear solution. The proportion of lime found in it by analysis

corresponded to 7.6 per cent. of anhydrous neutral calcium tartrate, $\text{Ca C}_4\text{H}_4\text{O}_6$, or to 10.5 per cent. of hydrated tartrate, $\text{Ca C}_4\text{H}_4\text{O}_6, 4\text{H}_2\text{O}$, or to 13.6 per cent. of acid tartrate of lime, $\text{Ca H}_2\text{C}_4\text{H}_4\text{O}_6$. The extent to which this substance extraneous to bitartrate of potash may be present in cream of tartar, must therefore appear somewhat different according to the nature of the compound which a certain determined percentage of lime is assumed to represent. Some analysts are in the habit of representing the amount of lime found in cream of tartar as acid tartrate, $\text{Ca H}_2\text{C}_4\text{H}_4\text{O}_6$, but the following experiment quoted by the author affords a strong argument against this supposition:—

Tartrate of lime was prepared from tartaric acid and carbonate of lime, using such proportions as would furnish a salt having the composition represented by the formula $\text{Ca H}_2\text{C}_4\text{H}_4\text{O}_6$. The boiling solution deposited on cooling crystals, which by analysis were proved to contain 21 per cent. Ca O , instead of 16.6 per cent.—the amount present in a true acid tartrate having the formula above mentioned. The anhydrous neutral tartrate, $\text{Ca C}_4\text{H}_4\text{O}_6$, contains 29.7 per cent., and the hydrated tartrate, $\text{Ca C}_4\text{H}_4\text{O}_6, 4\text{H}_2\text{O}$, 21.5 per cent. of lime; so that the proportion found agrees fairly with that calculated from the last-named formula. In calculating the percentage of lime for tartrate, allowance should be made for the small quantity of sulphate of lime which is often present.

As regards the presence of sulphate of lime in cream of tartar, the author points out that in a genuine sample this impurity can only exist in minute quantities, and that its occurrence in larger proportion must be attributed to adulteration.

Sulphate of baryta has also been occasionally found in samples of cream of tartar, and its presence therein is attributed by some chemists to the occurrence of some baryta compound in the material called yeso, or Spanish earth, which is used for plastering wine. But the fact that the sulphate of baryta in such cases is found very unequally distributed in the sample, and that it has been repeatedly observed in the form of powdered heavy spar adhering to the outside of the tartar crystals, from which it could be easily removed by mechanical means, induces the author to regard its presence as a proof of adulteration. The suggestion that sulphate of baryta might emanate from the grinding stones is disposed of by Dr. Paul as utterly untenable.

Potassium Bichromate as a Test for Distinguishing Tartaric from Citric Acid. C. Cailletet. (*Chem. Centralbl.* [3], 1879, 14.) A saturated solution of potassium bichromate quickly assumes a

dark brown colour on the addition of tartaric acid. It is only very slowly altered by citric acid. One gram of powdered citric acid added to 10 c.c. of the saturated test solution produces no appreciable change with ten minutes, while in the presence of but 1 per cent. of tartaric acid a distinct brown tint will be observed. By the same test vinegar prepared from wine, and therefore containing tartrates, can be distinguished from vinegar obtained from other sources. For this purpose the sample of vinegar is heated with an equal volume of the test solution.

Action of Chromates on Gums and Carbohydrates under the Influence of Light. J. M. Eder. (*Journ. prakt. Chem.* [2], xix., 294.) Gums, sugar, dextrin, gelatin, and albumen form, with potassium or ammonium bichromate, coagula, which alter and generally become insoluble in water on exposure to light. The coagulum of gum arabic, thus altered by the action of light, consists of chromium oxide and metagummic acid. In the case of gelatin, the insoluble coagulum contains chromium chromate combined with unaltered gelatin, and a good quantity of formic acid, which can be dissolved out by treatment with water. Formic acid is also produced when sugar is thus oxidized; but in this case the coagulum does not become insoluble in water. The insoluble coagulum yielded by albumen, consists of chromium oxide and some oxidized derivative of the albumen.

In all cases the action of the light proceeds more rapidly when the coagula are moist, than when they are exposed in the dry state.

Wood Gum. J. Thomsen. (*Journ. prakt. Chem.* [2], xix., 146.) This substance occurs in the wood of leafy trees, but not in that of the *coniferae*, and is more abundant in new than in old wood. It can be readily prepared by digesting beech sawdust with solution of ammonia, washing to remove the ammoniacal solution, then digesting the residue with solution of sodium hydrate, filtering, precipitating the gum from the filtrate by alcohol, washing the precipitate with alcohol, then freeing it from mineral matter by digesting with dilute hydrochloric acid, again washing with alcohol repeatedly, and finally with ether. It is thus obtained in the form of a colourless powder, which is insoluble in cold water and alcohol, but soluble in a large proportion of boiling water. The solution becomes opalescent on cooling, and forms precipitates with hydrochloric or acetic acid, sodium chloride, and sodium acetate. It is not affected by solution of iodine.

Wood gum is isomeric with cellulose, its composition being represented by the formula $C_6H_{10}O_5$.

The Formation of Resins. Prof. Dragendorff. (*Archiv der Pharm.* [3], xv., 50.) From observations on the resinification of essential oils, the author expresses himself in favour of the theory that all resins are formed by the oxidation of hydrocarbons. Certain essential oils which in the fresh state form clear mixtures with an excess of alcohol, cease to do so after they have been kept for some time, owing to the precipitation by the alcohol of the resin existing in solution in the old oil. His own experiments with the freshly prepared oil of unripe juniper berries do not confirm the statement by Godeffroy and Liebermann (*Zeitschr. des oesterr. Apoth. Ver.*, xv., 583), that this oil, even when quite fresh, forms a turbid mixture with alcohol.

Examination of Pavy's Method of Determining Glucose. O. Hehner. (*Journ. Chem. Soc.*, October, 1879, 834.) A short time ago Dr. Pavy published a new volumetric method for the estimation of grape sugar. (See *Chem. News*, xxxix., 77, or *Year-Book of Pharmacy*, 1879, 77.)

The author describes experiments which show that the amount of glucose oxidized by the Pavy solution is influenced to a large extent by the amount of sodium hydrate present, and that the ratio given by Pavy holds good only when the ammoniacal copper solution contains from 80 to 150 grams sodium hydrate per litre. Pavy's solution made from the ordinary Fehling solution recommended by Fresenius will contain only 68 grams NaHO per litre, and will give higher results in determining glucose (using Pavy's numbers) than the ordinary Fehling solution. If, on the other hand, the Pavy solution contains much more than 150 grams soda per litre, the results will be too low. With ordinary Fehling solution, 1 molecule of glucose requires 5 molecules of cupric oxide for oxidation; with the ammoniacal solution containing 120–150 grams NaHO per litre, 6 molecules of cupric oxide are required; and with the ammoniacal copper solution, containing no soda, the reaction proceeds very slowly, and requires 8 molecules cupric oxide. If the Pavy solution contains the proper quantity of sodium hydrate, the process is very satisfactory, and the termination of the reaction is exceedingly sharp.

The above remarks apply only to the determination of dextrose and lævulose. Milk-sugar appears to reduce less cupric oxide in Pavy's solution than in Fehling's solution, and its estimation with the former is even more unsatisfactory than with the latter.

A Simple Process for Detecting Nitrogen, Sulphur, and Chlorine in Organic Bodies. Dr. P. Spica. (*Gaz. Chim. Ital.*, 1870, No. 10.

From *Chem. News.*) Into a small tube, of about 5 mm. diameter, is put a small quantity of the substance under examination, along with a globule of sodium or potassium. It is heated strongly, and when the tube is red-hot the contents are thrown into a small beaker containing a few grams of pure water. The liquid is heated, filtered, and divided into three portions. If a drop, placed upon a slip of polished silver, produces a black spot, sulphur is present. Another portion of the liquid is treated with a mixture of ferric and ferrous salt, and then with a few drops of dilute hydrochloric acid, to dissolve the ferric hydrate. A blue coloration or precipitate indicates the presence of nitrogen. The remaining portion of the liquid is treated with dilute nitric acid, and then with silver nitrate, if the results of the former tests have been negative, in order to detect chlorine (bromine or iodine). If one or both of the former tests have given positive results, the liquid is heated for two minutes with its own volume of pure concentrated sulphuric acid, in order to decompose alkaline sulphide and cyanide, and silver nitrate is finally added.

Analysis of Organic Bodies containing Nitrogen. W. H. Perkin. (From papers read before the Chemical Society on Dec. 18th, 1879, and April 15th, 1880.) The author's method consists in the application of potassium chromate in the place of metallic copper for absorbing the oxides of nitrogen formed during the combustion of nitrogenous organic substances. The chromate to be used for this purpose must be quite free from excess of alkali. The author recommends a mixture of potassium chromate with 10 per cent. of bichromate as answering best. He uses a layer of about 6 inches of this mixture, and after the combustion is finished, expels the oxides of nitrogen by re-heating it strongly in a current of air, thus rendering it fit again for the next combustion. In this manner the chromate may be used several times.

The Determination of Potassium as Platino-Chloride. Dr. H. Precht. (*Chemiker Zeitung*, 1879, No. 49.) The author conducts the determination of potassium as follows:—

The sulphuric acid is removed by barium chloride in a solution containing 0.5 of hydrochloric acid to 1 of the salt. The clear liquid should contain neither barium chloride nor sulphuric acid. Traces of the latter may be removed in the measuring vessel by finely pulverized barium chloride. Small quantities of sulphuric acid are admissible if the solution with platinum chloride is not evaporated quite to dryness. In acid solutions the objection to the removal of sulphuric acid by means of barium chloride, *i.e.*, that

alkalies are carried down along with the barium sulphate, has little foundation. In neutral solutions so much potassium sulphate is thrown down that an error of 1 per cent. may be occasioned. In evaporating down with platinum chloride, care should be taken that large crystals of platino-sodic chloride are not formed, which would interfere with washing. The latter process is best performed with hot alcohol, there being no danger of the reduction of Pt Cl_4 . A mixture of alcohol and ether is not to be recommended, nor an addition of glycerin. For the determination of small quantities of potassium chloride along with an excess of sodium chloride, the author evaporates 10 to 100 grams along with a solution of platino-sodic chloride of known strength. The potassic salts are thus thrown down, the excess of the sodium compound is washed away with absolute alcohol, the platinum reduced on the filter and weighed.

Platinum Bromide. V. Meyer and Zublin. (*Ber. der deutsch. chem. Ges.*, xiii., 404.) Platinum bromide of formula Pt Br_2 was obtained by the authors by heating spongy platinum with bromine and hydrobromic acid to 180°C . in sealed tubes, filtering, and evaporating the filtrate. It is a blackish brown powder, undergoing no change on exposure to air, and readily soluble in water, alcohol, and ether, forming dark brown solutions.

Preparation of Bismuth Salts Free from Arsenic. R. Schneider. (*Journ. prakt. Chem.*, 1879, 418.) If commercial bismuth, contaminated with arsenic, be introduced in small successive portions into cold nitric acid of 1.20 specific gravity, a clear solution will be obtained, provided that tin and antimony are absent.

If, on the other hand, the acid be heated previous to the introduction of the bismuth, and the application of heat continued till the metal is dissolved, the resulting solution will contain in suspension a white insoluble powder, which does not disappear on the addition of more acid. The cold acid, in the first case, converts the arsenic into bismuth arsenite, which is readily soluble in nitric acid; while the treatment with hot acid results in the formation of bismuth arsenate, which is difficultly soluble in nitric acid, and quite insoluble in the solution of bismuth nitrate. On filtering the solution through asbestos without previous dilution with water, the precipitate may be removed, and the filtrate is now quite free from arsenic and well suited for the preparation of the subnitrate, subcarbonate, and other pure bismuth salts.

The white precipitate alluded to used to be erroneously regarded as a basic nitrate of bismuth.

The Detection of Traces of Bismuth. J. C. Thresh. (*Pharm. Journ.*, 3rd series, x., 641.) The method consists in adding to the fluid containing free hydrochloric or organic acid a few drops of potassium iodide solution, when instantly a rich more or less deep orange-coloured solution is formed. With 1 part of bismuth in 10,000 of water the colour is a distinct orange, with 1 in 40,000 the tint is still discernible in 1 c.c. of the solution, and with one in a million a decided yellow tint is evident when about 20 c.c. (·00002 gram) are placed in a narrow glass cylinder.

The presence of other metals presents no difficulty. Lead, mercury, and antimony alone are likely to interfere; but the addition of an excess of potassium iodide dissolves the mercuric iodide first precipitated, and lead iodide is soluble in boiling water; in both cases the supernatant or resulting solution is colourless unless bismuth also is present, when the colour of the double iodide of bismuth and potassium is very evident. With strong solutions of antimony containing much hydrochloric acid, iodide of potassium produces a reddish yellow colour when added in excess. A small quantity of this reagent, however, has no effect; whereas, when a trace of bismuth is also present in the solution, a single drop of the reagent strikes the characteristic tint.

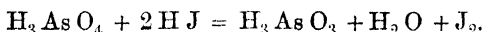
In analysing a complex mixture of inorganic salts, therefore, to detect bismuth, dissolve in hydrochloric acid the precipitate thrown down by the addition of ammonia to the nitric acid solution of the sulphides insoluble in ammonium sulphide, and divide into two portions. To one add a little dilute sulphuric acid (to detect lead) and to the other solution of potassium iodide, when the merest trace of bismuth will be recognised.

Detection of Arsenic in Forensic Analyses. Prof. Selmi. (*Chem. News*, xl., 144.) The method is that of Schneider modified so as to incur no losses. The substance to be examined is treated with hot concentrated sulphuric acid, and during the same time is traversed by a current of hydrochloric acid gas, which carries with it all the arsenic in the state of chloride, separating it from the organic substances with which it was mixed. The arsenical liquid is then placed in a Marsh's apparatus and tested in the usual manner. The author has been thus able to obtain the metallic ring on operating upon 100 grams of animal matter containing 1·400th of a milligram of arsenious anhydride. The author criticises the process of Gautier, which answers for recent matter, but should not be adopted if the subject is putrid or mummified.

Quantitative Determination of Arsenic in Forensic Analyses.

MM. Millot and Magneune. (*Correspondenzblatt des Ver. Analyt. Chem.*, January 15th, 1880.) A weighed quantity of the substance in which arsenic has been detected is treated with nitric acid, the filtered solution evaporated to dryness, the residue taken up with dilute sulphuric acid, and introduced into Marsh's apparatus. The evolution of hydrogen is kept up for two hours, and the gas passed into nitric acid, which will oxidize all the arsenic and antimony present. The nitric acid solution is evaporated to dryness, the arsenic acid extracted from the residue with water, and determined either by means of magnesia mixture, or, as the authors prefer, by a volumetric process with uranium acetate, using potassium ferrocyanide as an indicator. Full particulars are given respecting this volumetric process.

Volumetric Estimation of Arsenic Acid. W. A. H. Naylor. (*Pharm. Journ.*, 3rd series, x., 441.) The author's method is based on the reducing action of hydriodic acid on arsenic acid as represented by the following equation,—



A weighed portion of the substance containing about .04 gram of arsenic acid is dissolved in water acidulated with hydrochloric acid, the solution mixed with 5 c.c. of a 20 per cent. hydriodic acid solution, and the liberated iodine titrated by sodium hyposulphite. The presence of arsenites and phosphates does not interfere with the reaction. In order to prevent the oxidation of the hydriodic acid, the titration should be conducted in a current of carbonic acid gas. Full details are given, as well as analytical results showing the accuracy of the method.

The same reaction also affords an excellent means for the qualitative detection of traces of arsenic acid in the presence of arsenious acid.

Examination of the Methods for Determining Organic Matter in Water. F. Tiemann and C. Prensse. (*Journ. Chem. Soc.*, 1880. 290.) The authors have submitted some of the various methods proposed for this purpose to a critical examination, with the following results:—

1. *Determination by Ignition of the Solid Residues dried at 180°.*—To this method it is objected that (1) the organic matter not expelled by evaporation is alone taken into account; (2) silica present displaces carbonic acid, and this is not again taken up on evaporation with ammonium carbonate; (3) different mineral matter will retain different amounts of moisture at 180°; (4) some of the

chlorides of the alkalis will be volatilized. Finally, the organic matter will react on the inorganic matter present, *e.g.*, decomposing nitrates and nitrites into cyanates and cyanides.

2. *Frankland and Armstrong's* and *Dittmar and Robinson's* (*Chem. News*, 1877, 26).—To these methods the authors raise the objection that they do not take into consideration the organic matter volatilized by boiling in acid solution, nor the decomposition which the organic matter undergoes by evaporation in presence of sulphurous acid and ferrous chloride. Further, since the amount of carbon and nitrogen differs in organic compounds, this method gives no evidence of the absolute quantity of organic matter present; and only comparative results, when the mixture of the organic compounds in the waters compared is similar. This latter objection applies also to the following methods.

4. *Methods in which Potassium Permanganate is used as an Indicator.*—(a) Kubel's method (Kubel-Tiemann, *Anleti. zr. Untersuchung von Wasser*, ii. Aufl., 104). The water is acidified with sulphuric acid, and boiled with a quantity of centinormal potassium permanganate solution for ten minutes; the unused permanganate is destroyed by centinormal oxalic acid; and the excess of oxalic acid is determined by titration with permanganate solution. Thus the amount of potassium permanganate reduced by the organic matter is determined, and consequently the oxygen required for the latter's oxidation.

(b) Schulze's method (*Ibid.*, 102). This method differs from Kubel's, inasmuch as the water is rendered alkaline by adding a little soda, instead of being acidified with sulphuric acid. After boiling for ten minutes, the water is acidified with sulphuric acid, and the amount of unused potassium permanganate determined as before.

(c) Tidy's method (*Journ. Chem. Soc.*, 1879, 66). The advantage of these methods is that both the volatile and the non-volatile organic matter is taken into consideration. Of the three methods the authors prefer that of Kubel, as being the most free from sources of error, and at the same time the simplest.

5. *Fleck's Method* (*Journ. prakt. Chem.*, iv., 364).—The oxidizing agent used in this method is a solution of silver nitrate in sodium thiosulphate, made alkaline by soda. The water is boiled with this solution for ten minutes, and the silver in solution determined by titrating with a 1-20th normal solution of potassium iodide. The end of the reaction is reached when a drop of the solution, added to a drop of a mixture of hydrochloric acid, potassium permanganate, and starch-paste, produces a blue coloration.

The authors have made a series of experiments with solutions of various organic bodies, in order to compare the methods of Kubel and Fleck. The results obtained show that organic matter reduces potassium permanganate more quickly than the alkaline silver solution. Fleck claims that his method indicates the presence of volatile organic matter very delicately. These two methods have been compared with water saturated with coal gas, the result being that Kubel's method is judged the better of the two.

In order to settle the question whether the organic products of fermentation reduce potassium permanganate more strongly than the bodies from which they are formed, the authors have made the following experiments:—A dilute solution of albumen was titrated with permanganate solution when freshly made, and then after putrefaction had taken place. These experiments indicated that the products of putrefaction have a slightly stronger reducing action than the original compound.

In order to settle the question of the presence of volatile organic matter in waters, the authors have made experiments with some of the waters in Berlin, the mode of procedure being to (1) distil the water alone, (2) after acidifying with sulphuric acid, and (3) after making it alkaline by the addition of soda.

The following results were yielded by the water of a brook in the north-west of Berlin:—

100 c.c. of the water reduce 41·98 mgrm. $\text{K Mn O}_4 = 10\cdot62$ mgrm.

1. *Distillation of the Neutral Water.*

1st.	100 c.c. required	5·05 mgrm.	$\text{K Mn O}_4 = 1\cdot28$ mgrm.	O.
2nd.	"	"	2·59	" " = 0·65 " "
3rd.	"	"	1·56	" " = 0·39 " "
4th.	"	"	1·06	" " = 0·27 " "

2. *Distillation of the Acidified Water.*

1st.	100 c.c. required	4·15 mgrm.	$\text{K Mn O}_4 = 1\cdot14$ mgrm.	O.
2nd.	"	"	2·73	" " = 0·69 " "
3rd.	"	"	1·78	" " = 0·45 " "
4th.	"	"	1·61	" " = 0·4 " "

3. *Distillation of the Alkaline Water.*

1st.	100 c.c. required	4·28 mgrm.	$\text{K Mn O}_4 = 1\cdot08$ mgrm.	O.
2nd.	"	"	1·92	" " = 0·48 " "
3rd.	"	"	1·07	" " = 0·27 " "
4th.	"	"	1·04	" " = 0·26 " "

As 1 and 2 contain quantities of ammonium salts, the effect which these salts have on potassium permanganate was investigated.

As a result, it was found that 100 c.c. of a solution containing 100 mgrms. ammonia required 0.91 mgrm. KMnO_4 , which is equivalent to 0.24 mgrm. of oxygen; whereas a solution containing 1 mgrm. ammonia in 100 c.c. had no effect.

The disadvantage of Kubel's method is that from it no idea can be formed of the nitrogenous organic matter present; this, however, may be attained by the use of Wanklyn, Chapman and Smith's method of distilling with an alkaline solution of potassium permanganate. This latter method the authors have tried with solutions of such bodies as quinine sulphate, ethylamine hydrochloride, aniline hydrochloride, aspartic acid, urea, allantoin, leucine, tyrosine, and some others. As a result, the authors find that the ammonia given off is always less than that required by theory; but in such cases as leucine, aspartic acid, and tyrosine compounds (resulting from the putrefaction of albuminous matter), the quantity of ammonia approaches the theoretical very nearly. The results of this method yield no clue to the absolute quantity of nitrogenous organic matter in a sample of water, and the results obtained in two cases can be compared only when the mixtures of organic compounds in the different waters are similar.

Determination of the Organic Nitrogen in Natural Waters. G. Lechartier. (*Comptes Rendus*, lxxxix., 231.) The author objects to Frankland's process on the ground that the evaporation with sulphurous acid occasions a loss of nitrogen. The method he proposes consists in the complete decomposition of the ammoniacal salts present by evaporation with magnesia, the subsequent determination of the total nitrogen existing in the form of nitrates and organic matter, and the separate estimate of the nitric nitrogen. The organic nitrogen is thus found by difference.

Potable Water. How to form a Judgment on the Suitableness of Water for Drinking Purposes. C. Ekin. (Pamphlet addressed to Medical Officers of Health, Sanitary Authorities, etc.) This is an able and important contribution to the literature of the subject, which we strongly recommend to the attention of our readers, the more so since it is impossible to do justice to it in an abstract.

The most interesting portion of the pamphlet is the one which deals with the organic impurity in potable water, and its significance from a sanitary point of view. The author lays particular stress upon the fact that the relative proportion of organic matter, as determined by the chief analytical methods employed for this purpose, affords no reliable indication of the wholesomeness or unfitness of the water in question, and that it is the nature and not the

quantity of the organic matter present which constitutes the all-important point. The fatal error has been made of judging chiefly of the fitness of water for drinking purposes from the amount of organic matter it contains, quite irrespective of the nature and origin of the impurity, so that many water supplies of undoubted wholesomeness have been condemned, whereas others of more than doubtful purity have been classed as unpolluted. The processes employed by analysts for the determination of the organic matter fail to distinguish between animal and vegetable matter, between the hurtful and the harmless. Instances quoted by the author illustrate, in a forcible manner, that the presence in water of considerable quantities of vegetable organic matter is not incompatible with perfect wholesomeness; while other samples, containing but the merest traces of organic matter, have proved to be deadly poisonous to the consumer. Waters of the latter description invariably contain a large proportion of nitrates, a fact which induces the author to disagree with those who regard the presence of an excess of nitrates as no unfavourable indication, unless accompanied by an appreciable quantity of ammonia or organic matter. Cases of typhoid fever, have, in some instances, been unmistakably traced to the consumption of waters exceptionally free from the two last named impurities, and containing an excess of nitrates as the only chemical factor pointing to dangerous contamination. The author does not dispute that occasionally a large proportion of nitrates may occur in perfectly wholesome waters; but he contends that the burden of proof in such cases rests with those who recommend such waters as harmless, and that, on the whole, it is wiser to err on the safe side. Percolation through thick layers of porous and aerated soil may reduce the organic matter in a well-water to a minimum, but the trace left undestroyed by oxidation may still contain germs of fatal disease. It is not the mere determination of the amount of organic matter by one method or the other, but the collateral evidence afforded by the presence of nitrates, nitrites, chlorides, and phosphates, together with the source of the water, which throws light on the nature of the organic impurity.

Water Analysis. E. Böhlig. (*Zeitschr. für analyt. Chem.*, 1879, 195. From *Journ. Chem. Soc.*) The author points out some errors which often occur in the statements of results of quantitative analysis of mineral waters. In a previous paper (*Zeitschr. für analyt. Chem.*, 1879, 301) he has put forward reasons to prove that the analytical results obtained from a water after it has been boiled, cannot be considered as applicable to the water in its original state,

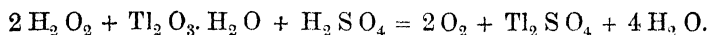
since ebullition brings about certain decompositions and changes. At a temperature slightly above 100°C ., calcium carbonate and magnesium sulphate are converted by double decomposition into magnesium carbonate and calcium sulphate, owing to the greater affinity of calcium for the sulphate radical. Therefore, in a solution containing equivalent quantities of sulphuric acid, lime, and magnesia, and excess of carbonic acid, the salts present will be calcium sulphate and magnesium carbonate. If, however, the free carbonic acid is removed at any temperature below 100° , calcium carbonate is precipitated, since it is the most insoluble compound which can be formed, and magnesium sulphate remains in solution. The author purifies water on this principle by adding magnesium hydrate, which at ordinary temperatures forms with the free carbonic acid magnesium carbonate, and this decomposes the calcium salts. If the carbonic anhydride is removed by simple boiling, the lime and carbonic acid are in most cases entirely precipitated as calcium carbonate, if magnesia is present in sufficient quantity; but when the boiling is continued, especially when the quantity of soluble salts present is considerable, the boiling point becomes higher, and calcium sulphate is formed, partly owing to the magnesium carbonate losing carbonic anhydride and being changed into the more insoluble basic carbonate, and partly owing to the affinity of calcium for the sulphate radical. This is proved by boiling magnesium sulphate solution with calcium carbonate, and passing the steam into lime-water; it is found that carbonic anhydride escapes and calcium sulphate remains in solution, whilst basic magnesium carbonate, or if the boiling point has risen considerably, even magnesium hydrate itself, remains in the precipitate. This explains why bitter waters, like the Hunyadi János, deposit basic magnesium carbonate when boiled; the carbonic acid may all be free or combined with magnesia, and the double decomposition between calcium sulphate and magnesium carbonate will be hindered by the increased solubility of calcium carbonate due to the quantity of sodium chloride and sulphate present. For the latter reason the separation of calcium carbonate on addition of magnesium hydrate to such a water is incomplete.

The basic magnesium carbonate separated by continued boiling is too sparingly soluble to decompose calcium sulphate in the water on cooling; but the carbonate formed by passing carbonic anhydride into boiling water in which magnesium hydrate is suspended, decomposes calcium salts very easily, 1 part reckoned as magnesia, is soluble in 20,000 of water. It is evident then that it is useless

to attempt to decide by boiling a water whether the magnesium salt it contains is carbonate or not, since any water containing calcium sulphate refuses to yield a magnesium carbonate precipitate when it is boiled. It also results from the above facts, that if the magnesium found corresponds with the acid-neutralizing power of the water, the magnesium is present entirely as carbonate, and only an excess of magnesium beyond the limit can be combined with stronger acid radicals.

Hence in the results of analysis, magnesium sulphate, nitrate, and chloride must not be entered with calcium carbonate. The decomposition occurring between calcium carbonate and magnesium sulphate in a water containing excess of carbonic acid is proved by adding lime-water to such a water, first before and then after the addition of the magnesium sulphate: in the first case calcium carbonate is precipitated, in the second case, owing to the conversion of calcium carbonate into calcium sulphate, no such precipitate is formed.

Hydrogen Peroxide. E. Schöne. (*Liebig's Annalen*, xcvi., 58-74, and 239-258. From *Journ. Chem. Soc.*) The following results directly contradict the observations of Schönbein (*J. pr. Chem.* [93], 38):—Thallic oxide is precipitated on the addition of hydrogen peroxide to an excess of thallium monoxide. When a neutral solution of hydrogen peroxide is added to thallic hydroxide, oxygen is evolved, but thallium monoxide is not formed; if the solution is acid, mutual reduction takes place,—

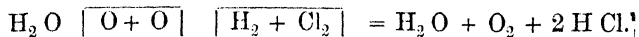


The coloration which ozone produces on paper moistened with thallous hydrate solution, is bleached by an acid but not by a neutral solution of hydrogen peroxide. Thallium paper is turned brown on exposure to the vapour of hydrogen peroxide: hence the presence of ozone in the atmosphere cannot be detected by this reagent.

Manganese and lead dioxides decompose a neutral solution of hydrogen peroxide, without undergoing any change themselves.

In the neutral decomposition which takes place when ozone is brought in contact with an aqueous solution of hydrogen peroxide, each substance loses the same volume of oxygen. The increase in the volume of the gas is equal to the sum of the volumes of oxygen lost by the ozone and by the hydrogen peroxide. These results confirm the accuracy of Brodie's experiments (*Phil. Trans.* [162], ii. 454).

Hydrogen peroxide is decomposed by chlorine water, with evolution of oxygen, one molecule of oxygen being evolved for each molecule of chlorine which takes part in the reaction, $\text{H}_2\text{O}_2 + \text{Cl}_2 = 2\text{HCl} + \text{O}_2$. It is, however, possible that only half the oxygen is derived from the hydrogen peroxide, the other half being due to the decomposition of a molecule of water by the chlorine, *e.g.* :—



The Products obtained in the Ozonisation of Air by Moist Phosphorus. A. R. Leeds. (*Journ. Chem. Soc.*, Nov., 1879, 881.) Sterry Hunt, as long ago as 1848, threw out the suggestion that the nitrogen of the atmosphere is really composed of two equivalents (atoms) of the element, sustaining towards each other the same relations as the two equivalents (atoms) in nitrous oxide. Schaeffer appears to have arrived at a similar conclusion concerning the dual nature of nitrogen, and holds Hunt's view, that it is the nitryl of ammonium nitrite, which is capable of forming this body by assuming again the elements of water. In 1862, Schönbein published an extensive series of experiments on the generation of ammonium nitrite from water and atmospheric air under the influence of heat. In none of these experiments, however, was the precaution apparently taken to use air which had been purified from its pre-existing ammoniacal and nitrous compounds. In repeating these experiments, Carius employed most elaborate precautions, using only air and water which had been most carefully purified. The water was evaporated both with a rapid and with a slow change of atmosphere, at various temperatures, from the ordinary temperature of the air to 100° , both alone and after addition of baryta, the latter being devoid of nitrogen compounds, in contact with platinum spirals, and diffused over a great surface of purified cotton-wool; but in no case was ammonium nitrite formed. In such experiments, therefore, it is of the highest importance to exclude the possibility of the formation of ammonium nitrite and nitrous compounds from any extraneous sources. In cases of rapid oxidation, like the combustion of hydrocarbons, fats, phosphorus and other bodies in the air, if it be true that ammonium nitrite is formed, irrespective of any nitrogen compounds pre-existing in the atmosphere, the origin of this ammonium nitrite is to be looked for in other causes than the conjunction of atmospheric air and water-vapour under the influence of heat. The same remark applies if any ammonium nitrite is formed by the slow oxidation of phosphorus in contact with air and water.

Quite independently of the work done by other observers, an extended series of experiments was instituted by the author upon the phenomena which accompanied the ozonisation of air by means of phosphorus. In the earlier trials, attention was limited to the question whether oxidized compounds of nitrogen were produced or not. Subsequently, the research was made to include all other bye-products. It was deemed important to purify and measure the air used and the ozone formed, to determine the amount of phosphorus consumed and of phosphoric and phosphorous acids produced, and in case they were really present and it were possible to estimate them, the amounts of nitrogen compounds, of hydrogen peroxide and ozone remaining in solution in the jar and wash-bottles.

The phosphorus ozonator described in the *Journal of the American Chemical Society*, vol. i., p. 8, was employed throughout the whole course of this investigation. The most important result which the author appears to have arrived at is that the chief bye-product of the ozonisation of moist air by phosphorus is not phosphorous acid but phosphoric acid. It is generally stated that the former of these two substances is the one principally formed under these circumstances. This may be true in the sense that the phosphorous acid is first formed, and that it is gradually transformed into phosphoric acid under the influence of nascent ozone. The author could not determine this point very readily in the course of these experiments. It is certainly an error to ascribe, as is done in various text-books, the dense white fumes seen in the ozonising chambers to ammonium nitrite—they are chiefly due to phosphoric anhydride.

The author's experiments do not permit him to say that no ammonium nitrite was formed during any period of the ozonisation; they prove merely that no ammonium nitrite could be detected at its close. If therefore this body were produced, it must have become oxidized to ammonium nitrate.

As to the cause of the formation of ozone itself under these circumstances, it may be conjectured, with Lamont and others, that it is connected with the uneven quantivalence of the elements taking part in the reaction, which may be represented by the equation $P_4 + O_{14} = P_2O_3 + P_2O_5 + 2O_3$. If this be true, we should anticipate the development of ozone whenever oxidation of a perissad occurred at temperatures compatible with the stability of the ozone molecule. In entering into new combinations, the oxygen molecules must undergo temporary resolution into their constituent atoms. These, while in the course of taking up new positions in other combinations, and animated by their atomic energy, or energy

of the nascent state, may either oxidize the oxygen molecule, or the nitrogen, or the molecule of water. In the first case ozone would be produced; in the second, regarding water as the basic and NNO as the nitryl, there might be formed, as Hunt has indicated, ammonium nitrate; and in the third, hydrogen peroxide.

The Formation of Ozone during the Slow Oxidation of Phosphorus. Prof. McLeod. (*Pharm. Journ.*, 3rd series, x., 514.) The active substance formed during the slow oxidation of phosphorus is probably either ozone or peroxide of hydrogen; the latter substance is readily destroyed by alkalis, a solution of chromic acid, or a solution of alkaline permanganate, whilst ozone is unaffected either by a solution of sodic carbonate, or by chromic acid, and appears to be only slightly attacked by alkaline permanganate. Air in which phosphorus was slowly oxidizing was drawn through a U tube, $9\frac{1}{2}$ inches long (filled with fragments of glass containing in succession sodic carbonate, saturated with carbonic anhydride, a mixture of potassic dichromate and sulphuric acid and potassic permanganate, previously saturated with carbonic anhydride), and then into a flask containing a solution of potassic iodide and starch; in all cases the latter solution became blue, both when the U tube was cold and when heated to 100° . Similar results were obtained when a U tube $12\frac{1}{2}$ inches long was used, packed with small pieces of pumice saturated with solution of sodic carbonate. The effect of heat on the gas was tried. The gas was aspirated through a narrow U tube, which was heated to 150° and 200° , beyond this U tube were placed, first a weighed U tube, packed with pumice and sulphuric acid, and secondly, a flask with solution of potassic iodide and starch, acidified with sulphuric acid. The U tube was weighed before and after each experiment, and the blue solution titrated with decinormal sodic thiosulphate. The gas was aspirated at the rate of 1 litre per hour. The following results were obtained:—

Gas Aspirated.	Temperature of U Tube.	Increase of Sulphuric Acid Tube.	Thiosulphate used.
4600 c.c.	Cold	0.0026 gram.	2.55 c.c.
2760 c.c.	100°	0.0008 gram.	1.9 c.c.
4600 c.c.	150°	0.0026 gram.	3.2 c.c.
2760 c.c.	200°	0.0006 gram.	1.8 c.c.

1 c.c. of thiosulphate = 0.017 gram of hydroxyl, which, on de-

composition, forms 0.009 gram of water, and as at least one-half of the hydroxyl might be assumed to be decomposed, an increase of the sulphuric acid tube in the last experiment should be 0.016 gram instead of only 0.0006. Hydroxyl combines with acids, the gas from phosphorus was exposed to the action of strong sulphuric acid for four days without losing its activity. It is extremely improbable that ozone and hydroxyl are both formed, as these substances destroy each other. The author therefore concludes that the gas obtained during the slow oxidation of phosphorus possesses the properties of ozone, and not those of hydroxyl, the only known peroxide of hydrogen.

Note on the Assumed Formation of Ozone by the Atmospheric Oxidation of Phosphorus. C. T. Kingzett. (From a paper read before the Chemical Society, Feb. 5th, 1880.) The author thinks that it remains yet to be proved whether the active body formed during the atmospheric oxidation of phosphorus does contain ozone or hydrogen peroxide only, and does not accept as conclusive Prof. McLeod's experiments on this subject mentioned in the foregoing paper. Referring to these experiments, he points out that 1 c.c. of decinormal thiosulphate is not equivalent to 0.017 gram of hydroxyl, but to 0.017 gram; so that the gain in the sulphuric acid should be 0.0016, and not 0.016 gram. He intends to reinvestigate this subject and to publish his results.

Solubility of Ozone in Water. A. Luds. (*Ber. der deutsch. chem. Ges.*, xii., 1831.) Schönbein, Marignac, and Andrews regard ozone as insoluble in water; while Carius, Meissner, and Houzeau state it to be soluble therein.

The author has reinvestigated this question, and finds that ozone is decidedly soluble in water, and that in its solution it possesses the maximum of its oxidizing power.

The Alleged Existence of Hydrogen Peroxide in the Sap of Plants. G. Bellucci. (*Gaz. Chim. Ital.*, viii., 392.) The author quotes a number of experiments disproving Clermont's assertion as to the existence of hydrogen peroxide in the sap of plants. The blue coloration which Clermont obtained, with Schönbein's reagent (potassium oxide, starch, and ferrous sulphate), is attributed by him to the action of the ferrous salt on the tannin present in the plants. The test employed by the author was the one with chromic acid and ether, and this gave negative results in every instance.

Organic Ferricyanides. O. Bernheimer. (*Ber. der deutsch. chem. Ges.*, xii., 408.) The compounds described by the author

are, tetramethylammonium ferricyanide $(NMe_4)_6 Fe_2 Cy_{12} + 6 H_2 O$, and tetraethylammonium ferricyanide $(NEt_4)_6 Fe_2 Cy_{12} + 8 H_2 O$. The former is obtained by treating silver ferricyanide with a saturated solution of tetramethylammonium iodide, filtering to remove the silver iodide formed, and evaporating the filtrate over sulphuric acid in vacuo. The ethyl compound is prepared in a corresponding manner. Both crystallize in plates, which are soluble in water and hot alcohol, but insoluble in cold alcohol and ether. The aqueous solutions form reddish brown colorations with ferric chloride, and blue precipitates with ferrous sulphate.

Heat decomposes both salts with the evolution of methylamine and ethylamine respectively.

Researches on Ferricyanides. J. Schüller. (*Wien. Akadem. Ber.*, 77 [ii.], 592-602. From *Journ. Chem. Soc.*)

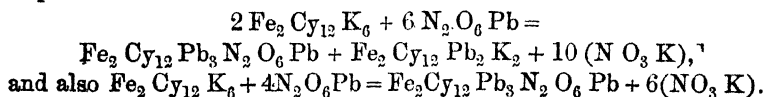
Barium Ferricyanide, $Fe_2 Cy_{12} Ba_3 + 20 H_2 O$.—Obtained by oxidizing barium ferrocyanide with lead peroxide. The salt forms large brown-red crystals. It is easily soluble in water, but is insoluble in alcohol. The crystals effloresce in warm or dry air, and become covered with an orange-yellow crust. After long exposure to light, the powdered crust no longer dissolves completely in water, a greenish powder, together with some barium ferrocyanide, remaining behind. In the solution much undecomposed ferricyanide, mixed with some ferrocyanide, is found. On being heated to 100° the yellow powder turns green superficially, and dissolves in water almost entirely. This reaction signifies a loss of 14 mols. of water.

Lead Ferricyanide, $Fe_2 Cy_{12} Pb_3 + 4 H_2 O$.—Obtained by saturating lead carbonate with hydroferricyanic acid. The salt crystallizes in yellowish brown plates. The crystals produce a bronze-like mark on an earthenware plate. They are soluble in water, with difficulty in alcohol. In the dark the salt remains permanent, but when exposed to light, it suffers alteration both of colour and weight.

Lead Ferricyanide with Lead Nitrate, $Fe_2 Cy_{12} Pb_3 \cdot N_2 O_6 Pb + 12 Aq$.—Contrary to the statements of Gmelin and V. Zepharovich (Gmelin's *Handbuch*, Bd. i., p. 396, *Wien. Akad. Ber.*, 59 [ii.], 805), the author finds that the above compound separates from mixed solutions of potassium ferricyanide and lead nitrate, in small garnet-like crystals, the larger ones being almost black and with a glassy lustre. The aqueous mother-liquors from the above crystals are partially decomposed on evaporation, with liberation of hydrocyanic acid, and separation of a greenish blue precipitate. A solution of the salt, when exposed to light, suffers slight decomposition, with separation of a light blue precipitate, consisting of lead ferro-

cyanide with some Prussian blue. The salt is much more soluble in hot than in cold water. The crystals are permanent in the air when protected from light. At 100°, they lose 12·6 per cent. of their weight; with stronger heating, hydrocyanic acid is evolved, and the mass becomes incandescent.

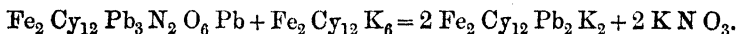
From mixed solutions of lead nitrate and potassium ferricyanide some of the above double salt is first obtained, and by evaporating the mother-liquors, potassium nitrate and large tabular black crystals of lead-potassium ferricyanide. The following equations express these formations:



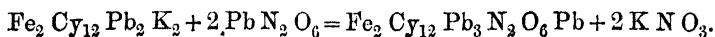
As lead nitrate and potassium ferricyanide did not yield lead ferricyanide, lead acetate was substituted for the nitrate, but it was found that both salts crystallized separately.

Lead Ferricyanide with Lead Oxide, $\text{Fe}_2 \text{Cy}_{12} \text{Pb}_3 \cdot \text{Pb}_3 (\text{O H})_6 + 11 \text{H}_2 \text{O}$.—Obtained by mixing concentrated solutions of lead potassium ferricyanide or lead ferricyanide and basic lead acetate. The solutions must be allowed to stand some time in a well-closed flask. The salt consists of almost black cubical crystals, yielding a yellow powder on pulverization. Sparingly soluble in alcohol and water, but more easily in a hot solution of basic lead acetate, and easily in acetic acid. 11 mols. water are lost at 100°. It is not altered on exposure to light.

Lead-Potassium Ferricyanide, $\text{Fe}_2 \text{Cy}_{12} \text{Pb}_2 \text{K}_2 + 6 \text{Aq}$.—Obtained by the action of solutions of 1 mol. of potassium ferricyanide, or 2 mols. of potassium sulphate on 1 mol. of the compound of lead ferricyanide with lead nitrate,—



Black, glassy, tabular crystals, appearing dark red by transmitted light. One part of the salt requires for solution 4·75 parts of water at 16°. It is very little soluble in absolute alcohol, and loses its six mols. of water of crystallization at 100°; and also by merely standing over sulphuric acid. The compound of lead ferricyanide with lead nitrate is again obtained by acting with a solution of lead potassium ferricyanide on one of lead nitrate—



Ammonium-Lead Ferricyanide, $\text{Fe}_2 \text{Cy}_{12} \text{Pb}_2 (\text{N H}_4)_2 + 6 \text{Aq}$.—Prepared like the potassium-lead ferricyanide. Black, glassy, tabular

crystals, more soluble in hot than in cold water. The aqueous solution decomposes on evaporation or exposure to the air. The salt is with difficulty soluble in alcohol. All the water of crystallization is lost at 100° , or on drying over sulphuric acid; the salt becoming anhydrous, and changing from yellow to a greenish colour. No analogous compounds could be obtained with sodium, lithium, or calcium.

Oxyferrocyanide of Copper and Ammonium. A. Guyard. (*Bull. Soc. Chim.* [2], xxxi., 435.) A solution of ammonio-sulphate of copper forms with potassium ferrocyanide a brownish precipitate of ammonio-ferrocyanide of copper, which, when dried and heated to about 170° C., parts with a portion of its ammonia and cyanogen, and takes up oxygen, being thus converted into a violet compound termed by the author oxyferrocyanide of copper and ammonium. A higher oxidized body of a blue colour is formed by heating the violet compound to 200° C., at which temperature it parts with more ammonia and cyanogen, without, however, absorbing any more oxygen. By raising the temperature of this blue compound to 250° , a further loss of these two gases takes place, and a still more oxygenated body of a green colour is produced. A temperature of 300° and above causes complete decomposition, resulting in the formation of oxides of copper and iron.

The Direct Combination of Cyanogen with Hydrogen and Metals. M. Berthelot. (*Comptes Rendus*, lxxxix., 63.) When equal volumes of hydrogen and cyanogen are slowly passed through a glass tube, heated to 500 – 550° C., only a small proportion of hydrocyanic acid is formed; but if the gas mixture be heated for several hours to the same temperature in sealed tubes, upwards of 70 per cent. of the cyanogen present combines with hydrogen to form hydrocyanic acid. The combination of the two gases under the influence of electric sparks, is regarded by the author as possibly due to a secondary action, acetylene and free nitrogen being first produced, which then unite and form hydrocyanic acid.

When cyanogen is heated with zinc, cadmium, or iron, at about 300° C. in sealed tubes, cyanides of these metals are formed, together with some paracyanogen. The direct combination of cyanogen with hydrogen and the metals affords further evidence of the analogy existing between this radical and the halogens.

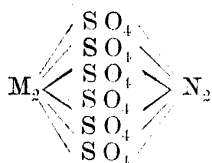
Action of Potassium Permanganate upon Potassium Cyanide. E. Baudrimont. (*Comptes Rendus*, lxxxix., 1115.) When potassium permanganate is allowed to act upon a solution of potassium cyanide, the permanganate is decolorized. The decomposition

proceeds more rapidly with an elevation of temperature and a greater concentration of the solutions, but is less rapid in the presence of much free sulphuric acid. Two equivalents of potassium cyanide are capable of decolorizing five equivalents of KMnO_4 . The decomposition results in the formation of urea, ammonia, and carbonic, nitric, nitrous, oxalic, and formic acids. The quantity of urea increases with the proportion of free sulphuric acid used; while in an alkaline solution but a small quantity of urea, and a considerable proportion of nitrite, are produced.

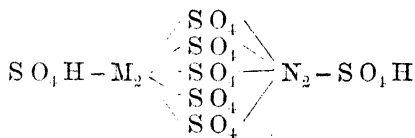
Volumetric Estimation of Sulphates. Dr. H. Precht. (*Zeitschr. für analyt. Chem.*, xviii., 521.) The author modifies Willdenstein's method as follows:—The sulphuric acid is precipitated with an excess of standard normal barium chloride; an excess of standard potassium chromate is then added, the mixture rendered slightly alkaline with sodium hydrate, and made up to a definite volume by the addition of water. The excess of chromate is now determined in a measured portion of the filtered mixture by titration with ferrous sulphate in presence of free sulphuric acid, potassium ferricyanide being used as an indicator.

Researches on Sulphates. A. Etard. (*Bull. Soc. Chim.* [2], xxxi., 200–204. From *Journ. Chem. Soc.*) In this paper the author describes a number of double sesquisulphates, the formation and constitution of which he represents in the following manner:—

When a sesquisulphate, $(\text{M}_2)^{\text{vi}}(\text{SO}_4)_3$, is dissolved in concentrated sulphuric acid, we may suppose the formation of an acid salt, according to the equation $\text{M}_2(\text{SO}_4)_3 + 3 \text{H}_2\text{SO}_4 = \text{M}_2(\text{HSO}_4)_6$. When the temperature of a solution containing two such salts is progressively raised to nearly the boiling point, 2 molecules of the bisulphates may part with 6, 5, or 4 molecules of H_2SO_4 , to give the following derivatives,—



Neutral Salt.



1st Acid Salt.



2nd Acid Salt.

Preparation.—The sesquisulphates to be combined are dissolved in a little cold water, a large excess of concentrated sulphuric acid is added, and the solution heated until it deposits a crystalline precipitate; this is collected in a funnel whose neck is stopped with a plug of glass wool, drained by the filter-pump, washed successively with pure sulphuric acid, anhydrous acetic acid, and alcohol, and then dried in the oven. Instead of sulphates, salts of the sesquioxides with volatile acids may be employed.

For the chromium compounds, 2 molecules of chromic acid may be used instead of a chromic salt. Manganese requires particular treatment on account of the difficulty of obtaining salts of the sesquioxide; instead of a manganic salt, 2 molecules of a manganous salt are dissolved in the sulphuric acid, together with the sesquisulphate of the other metal, and as soon as a precipitate begins to form on heating the solution, nitrosulphuric acid is added in small portions, until the liquid assumes a violet colour, and deposits a precipitate, which contains the manganese in the state of sesquioxide. This oxidation succeeds only in the presence of another sesquisulphate.

Acid Sesquisulphate of Iron and Alumina, $\text{Al}_2(\text{SO}_4)_6\text{Fe}_2\cdot\text{SO}_4\text{H}_2$.—Minute white hexagonal plates, insoluble in water, which, however, slowly decomposes it. On heating, it loses H_2SO_4 , and becomes the *neutral salt*, $\text{Al}_2(\text{SO}_4)_6\text{Fe}_2$, which is also obtained by heating the sulphuric solution to a higher temperature; it is white, and insoluble in water or acids.

Acid Sesquisulphate of Iron and Chromium, $\text{Cr}_2(\text{SO}_4)_6\text{Fe}_2\cdot\text{SO}_4\text{H}_2$.—Crystalline, yellowish, and insoluble. *Neutral salt*, $\text{Cr}_2(\text{SO}_4)_6\text{Fe}_2$, insoluble.

Sesquisulphate of Iron and Manganese, $\text{Mn}_2(\text{SO}_4)_6\text{Fe}_2$.—Crystalline, insoluble, of a fine green colour (similar to *Rinnmann's green*); it decomposes hydrochloric acid, with disengagement of chlorine.

Acid Sesquisulphate of Chromium and Manganese, $\text{Cr}_2(\text{SO}_4)_6\text{Mn}_2\cdot\text{SO}_4\text{H}_2$.—Crystalline, chocolate-brown, soluble in water with decomposition; disengages chlorine from hydrochloric acid.

In preparing this salt, the sulphuric solution must be withdrawn from the heat before a precipitate forms, and allowed to cool. By continuing to heat, the *neutral salt*, $\text{Cr}_2(\text{SO}_4)_6\text{Mn}_2$, is obtained; it is yellowish green, crystalline, and is attacked by hydrochloric acid, with disengagement of chlorine.

Acid Sesquisulphate of Chromium and Aluminium, $\text{Cr}_2(\text{SO}_4)_6\text{Al}_2\cdot\text{SO}_4\text{H}_2$.—Crystalline, pale green; heated in the sulphuric solution, it gives the *neutral salt*, $\text{Cr}_2(\text{SO}_4)_6\text{Al}_2$.

Sesquisulphate of Aluminium and Manganese, $2\text{Al}_2(\text{SO}_4)_3 \cdot \text{Mn}_2(\text{SO}_4)_3$.—Sky-blue crystalline sand, insoluble in water, which decomposes it very slowly; soluble in hydrochloric acid, with disengagement of chlorine.

These salts are for the most part insoluble, although some of them contain as much as 80 per cent. SO_4 .

If, instead of combining the sesquisulphates of two different metals, a double quantity of the same sesquisulphate be taken, we produce a class of bodies already known. These are the *insoluble* modifications of ferric, aluminic, and chromic sulphates. The best known of these is the red chromic sulphate, a neutral salt according to some authors, acid according to others. This rose-grey salt (bright rose on heating), is extremely stable, and insoluble in acids; its formula is $\text{Cr}_2(\text{SO}_4)_6 \cdot \text{Cr}_2$. Another chromic sulphate has the formula $\text{Cr}_2(\text{SO}_4)_6 \cdot \text{Cr}_2 \cdot \text{SO}_4 \cdot \text{H}_2$; this is the one to which Traube assigned the formula $2(\text{Cr}_2\text{O}_3 \cdot 3\text{SO}_3) \cdot \text{SO}_4 \cdot \text{H}_2$.

Preparation of Distilled Water Free from Ammonia. J. S. Thomson. (*Chem. News*, xl., 18.) In order to obtain an abundant supply of distilled water perfectly free from ammonia, the author suggests a simple modification of the distilling apparatus commonly found in laboratories. The tube which conducts the vapour from the still or boiler, in place of being connected directly with the worm, is made to enter at the bottom of a large iron drum, while the top of the drum is connected with the worm pipe in the ordinary manner. The drum, which is freely exposed to the air, condenses a portion of the aqueous vapour, and the condensed water falling to the bottom is kept in a state of ebullition by the free steam blowing into it. Now, if this condensed water be drawn off by a suitable tap, it will be found to be entirely free from ammonia, as the whole of that gas passes into the distilled water collected at the worm end.

Preparation of Pure Sulphuretted Hydrogen for Forensic Analyses. R. Otto. (*Ber. der deutsch. chem. Ges.*, xii., 250.) J. Otto and others have shown that sulphuretted hydrogen prepared as usual from impure materials, may contain arsenic in the form of arseniuretted hydrogen, and can be detected in it by passing the gas first through an alkaline solution, and then through hot nitric acid, evaporating the nitric acid solution and testing the residue in Marsh's apparatus. It is supposed that the arsenic present in the sulphuric acid is first precipitated as sulphide, and that the latter is subsequently acted upon by the nascent hydrogen formed from the metallic iron always occurring to some extent in the sulphide.

The author now shows that this contamination of sulphuretted hydrogen is not in all cases due to the use of impure acid, but that the presence of arsenic in the ferrous sulphide leads to the same result, even if perfectly pure sulphuric acid be used.

The author points out the importance of guarding against this contamination in chemico-legal investigations, in which large quantities of sulphuretted hydrogen are often required to be used for the complete precipitation of even very small amounts of arsenic. To avoid the risk of a serious error, he recommends that in such cases sulphuretted hydrogen should be prepared by the action of pure hydrochloric acid on pure calcium sulphide obtained by roasting gypsum with charcoal. As the gas thus evolved does not contain any free hydrogen, its contamination with arsenic is not to be feared, even if the acid should contain this impurity. To be doubly sure, however, none but perfectly pure acid ought to be used.

Action of Ammonium Salts on Some Metallic Sulphides, and its Application in Analysis. P. de Clermont. (*Bull. de la Soc. chim.*, 1879, 483.) The sulphides of bismuth, cadmium, copper, and platinum can be boiled with solution of ammonium chloride without suffering any decomposition. The sulphides of mercury, when similarly treated, are slightly attacked, while sulphide of antimony is completely decomposed, with the evolution of ammonium sulphide and the formation of a solution of chloride of antimony. The sulphides of tin, under the same conditions, are converted into the corresponding oxides. The sulphides of manganese and iron are wholly, and those of cobalt, nickel, and zinc partially, converted into soluble chlorides, while the hydrates of aluminium and chromium remain unattacked. The author bases upon these observations a method for the analysis of the group of metals precipitated by ammonium sulphide. The solution containing Mn, Fe, Co, Ni, Zn, and Cr is precipitated with ammonium sulphide, the washed precipitate added to a hot solution of ammonium chloride, and boiled with it for some time. By this treatment the whole of the manganese and iron, together with a part of the cobalt, nickel, and zinc, pass into solution; while aluminium and chromium hydrates, along with the undecomposed portions of the sulphides of nickel, cobalt, and zinc, remain undissolved. Owing to the compactness of the precipitate, the filtration of the boiled mixture proceeds very rapidly. The separation of the constituents of the precipitate and of the filtrate may now be effected by the usual analytical methods. Experiments have satisfied the author that iron

and manganese may thus be separated from aluminium and chromium with sufficient accuracy to render the process available also for quantitative purposes.

Other ammonium salts react with metallic sulphides in the same manner as the chloride.

Dissociation of Ammonium Sulphide and Ammonium Hydrosulphide. R. Engel and A. Moitessier. (*Comptes Rendus*, lxxxviii., 1201, 1354.) Bineau (*Ann. Chim. Phys.*, lxx., 76) stated that ammonium sulphide exists only at very low temperatures. In 1869, Deville and Troost gave the density of this compound as 1.26 (air = 1). Horstmann, in 1863, concluded, from the results of the determinations of the density of mixtures of hydrogen sulphide and ammonia, that these two gases do not combine at temperatures between 53.4° and 85.9° . The authors find (1) that two volumes of ammonia and 1 volume of hydrogen sulphide combine at ordinary temperatures to form ammonium sulphhydrate, 1 volume of ammonia remaining uncombined; (2) the product dissociates very rapidly with elevation of temperature, and at 45° the dissociation is complete. The gases recombine on cooling.

Ammonium Hydrosulphide.—A bell-jar was filled, over mercury, with equal volumes of ammonia gas and sulphuretted hydrogen, and maintained at 50° . On the introduction of a piece of charcoal, previously ignited, absorption of the mixed gases took place, and the volume of the gases diminished by three-fourths. The charcoal was then withdrawn, placed in a vacuous bell-jar over mercury, and warmed, when the absorbed gases were expelled. On cooling crystals formed on the side of the jar, and on introducing a piece of pumice-stone saturated with sulphuric acid, the residual gas was entirely absorbed, showing it to be ammonia. In the case of the gas remaining in the original jar, after the withdrawal of the charcoal, no absorption occurred, showing the absence of ammonia gas.

If combination had taken place on mixing the gases at 50° , condensation would have taken place, but no such effect was noticed; and, moreover, the gases would have been absorbed by the charcoal in equal volumes, and when again expelled by heat would not have contained excess of ammonia. The formation of crystals on the sides of the jars shows that combination takes place on cooling.

It is therefore evident that at 50° ammonium hydrosulphide does not exist; but is dissociated. On cooling, however, the gases reunite, forming the original compound.

Sulphides of Phosphorus. G. Ramme. (*Ber. der deutsch. chem.*

(*Ann.* xii., 1350.) The author shows that the liquid sulphides of phosphorus are decomposed on heating with water. The decomposition of the sulphide P_3S_6 results in the formation of phosphorus, phosphoric, and hydrosulphuric acids.

A sulphide of the formula P_1S_3 is obtained in the form of yellow prisms by heating the sulphide P_3S_6 with phosphorus in a current of carbonic acid gas at $320^\circ C.$, or by heating a mixture of sulphur and amorphous phosphorus in a tube at $260^\circ C.$, and crystallizing the product of either reaction from carbon bisulphide. The crystals thus obtained melt at $166^\circ C.$

The Preparation of Phosphoric Acid. W. F. Horn. (*Pharm. Journ.* series, x., 468, from *Proc. Pennsylvania Pharm. Assoc.*) The process recommended by the author is as follows:—Six hundred grains of phosphorus are covered with three ounces of water in a flask capable of holding at least a pint. Two grains of iodine are placed in a test tube and brought into contact with the phosphorus by gently agitating the flask, after which four troy ounces of nitric acid are added to the mixture. The action begins at once, and the process requires no further attention until the oxidation of the phosphorus is completed, which will take from twenty-four to thirty-six hours. The product is then evaporated and finished in the manner directed by the Pharmacopœia. Under ordinary conditions of temperature and pressure, the rapidity of the oxidation depends upon the amount of iodine used, and should the necessity arise, the process can be proportionately shortened by using four, six, or more grains of iodine; but in that case the action must be moderated by surrounding the vessel with cold water. On the other hand, if there is no urgency, one grain, or even a fraction of a grain, will accomplish the same purpose in a longer time.

The advantages of this process are economy of time, attention, and material, and absolute safety from explosions. The process may be continued indefinitely, and large quantities of phosphorus may be oxidized to phosphoric acid by the addition of new portions of phosphorus and nitric acid as fast as they are consumed, no further addition of iodine being necessary. A much less quantity of nitric acid will accomplish the work, under favourable conditions, owing to the peculiar property which nitric oxide possesses of absorbing oxygen spontaneously from the air, thereby being converted into hyponitric acid, in which condition it is ready to act again on a fresh quantity of phosphorus, its action in this case being comparable to that in the vitriol chambers.

The theory of this process is based on the discovery of Brodie

that the iodine converts the vitreous phosphorus into the amorphous variety, which is oxidized by the nitric acid.

The method differs from that of Pettenkofer, who treats phosphorus iodide with water, and obtains phosphorus acid, which is oxidized by nitric acid.

Dibasic Calcium Phosphate. A. Millot. (*Bull. de la Soc. chim.*, 1880, 194.) This salt, when prepared without heat and afterwards dried at 100°C ., corresponds to the formula $\text{Ca H P O}_4 + 4\text{H}_2\text{O}$. It is readily and completely soluble in an ammoniacal solution of ammonium citrate. It begins to part with water at 115°C ., and when rendered anhydrous it is no longer soluble in the citrate solution without prolonged digestion with the solvent.

On boiling the salt with water it is decomposed, with the formation of a solution of acid calcium phosphate, and a precipitate consisting of a mixture of dibasic and tribasic salt; and if this precipitate is again repeatedly boiled with water, the insoluble residue finally remaining is entirely composed of the tribasic phosphate. When the dibasic salt is boiled with water and calcium carbonate, carbonic acid gas is expelled, and tribasic phosphate results, which is quite insoluble in the above-named citrate solution.

An acetic acid solution of tribasic calcium phosphate, when heated to $50\text{--}60^{\circ}\text{C}$., deposits a dibasic phosphate containing three molecules of water. If the heat be raised to 100° , the tribasic salt is precipitated.

A mixed solution of sodium phosphate, calcium chloride, and acetic acid yields on boiling dibasic calcium phosphate containing one molecule of water, together with a small variable amount of tribasic salt. Dibasic calcium phosphate, containing five molecules of water, can be obtained from sodium phosphate and calcium chloride at an ordinary temperature.

Phosphates of Zinc. W. Demel. (*Ber. der deutsch. chem. Ges.*, xii, 1171.) When zinc oxide is dissolved in an excess of aqueous phosphoric acid, and the solution allowed to stand for a few hours, crystals of acid phosphate of zinc, $\text{Zn H}_4\text{P}_2\text{O}_7 + 2\text{H}_2\text{O}$, belonging to the triclinic system, are obtained, which are permanent in the air, and lose from 1.15 to 1.86 per cent. of water at 100°C . They are soluble in hydrochloric acid, and suffer no change when treated with alcohol or ether; but when mixed with two or three volumes of water they split up into free phosphoric acid, and an insoluble basic compound of the formula $10\text{ZnO} \cdot 4\text{P}_2\text{O}_5 \cdot 10\text{H}_2\text{O}$. The substance is a white crystalline powder, soluble in dilute hydrochloric acid. It parts with about 1.6 per cent. of water at 100°C ., and

with 10 per cent. at 280°C ., without being changed in appearance.

Preparation of Pure Sodium Hypophosphite. M. Boymond. (*Répert. de Pharm.*, vii., 328.) Commercial sodium hypophosphite always contains phosphite and phosphate. A perfectly pure preparation may be obtained by dissolving 25 grams of the commercial salt, together with 1 gram of barium hypophosphite, in a moderate quantity of water, so that the whole does not exceed 50 c.c., then adding 200 c.c. of absolute alcohol, allowing to stand, filtering, removing every trace of barium from the filtrate by the addition of the requisite quantity of sodium sulphate, next adding 100 c.c. of absolute alcohol, decanting the clear solution from the precipitate, and mixing it with 500 c.c. of absolute alcohol and sufficient absolute ether to allow of the mass being well agitated. The sodium hypophosphite is hereby completely separated, and only requires collecting on a filter and drying in a current of air. The product is entirely free from phosphite and phosphate.

Zinc and Cadmium Arsenates. W. Demel. (*Ber. der deutsch. chem. Ges.*, xii., 1279.) A solution of oxide of zinc in aqueous arsenic acid deposits during evaporation crystals which, after washing with ether and drying over sulphuric acid, answer to the formula $\text{Zn H As O}_4 + \text{H}_2\text{O}$. The mother-liquor yields a further quantity of the same salt by precipitation with alcohol. When treated with water this salt yields a crystalline basic compound of the formula $10\text{Zn O} \cdot 4\text{As}_2\text{O}_5 \cdot 10\text{H}_2\text{O}$. Both products are soluble in hydrochloric acid. On neutralizing these acid solutions with an alkali, zinc arsenate of the formula $\text{Zn}_3 2\text{As O}_4 + 3\text{H}_2\text{O}$ is precipitated, the product being the same as the one obtained from zinc sulphate by precipitation with sodium arsenate.

Cadmium forms combinations with arsenic acid analogous to those of zinc.

Chromates of Iron and Alkalies. C. Hensgen. (*Ber. der deutsch. chem. Ges.*, xii., 1656.) Ferric potassium chromate, $\text{K}_2\text{CrO}_4 \cdot \text{Fe}_2 3\text{Cr O}_4 \cdot 4\text{H}_2\text{O}$, is obtained in the form of dark-red plates during the slow evaporation of a solution of ferric chloride and potassium bichromate. The corresponding ammonium salt is obtained in an analogous manner.

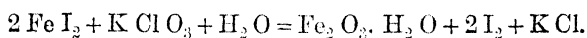
The Action of Potassium Chlorate on Ferrous Iodide. R. H. Parker. (From a paper read before the Pharmaceutical Society, April 21, 1880, and printed in the *Pharm. Journ.*, 3rd series, x., 850.) When a solution of potassium chlorate is mixed with the syrup of iodide of iron, a nearly colourless solution is obtained, which on

standing a few hours acquires a reddish brown colour and an evident odour of iodine. This change is followed by the subsidence of a red precipitate and deeper colour of the supernatant liquid; in a few days the solution becomes supersaturated with iodine, and crystals of this element are deposited. Sodium chlorate produces a similar decomposition.

In a number of experiments recorded by the author, varying quantities of potassium chlorate (0.2 to 2.0 grams) were mixed with 10 c.c. of syrup of ferrous iodide diluted with 30 c.c. of water, and allowed to stand at ordinary temperatures; some of the bottles were completely filled in order to exclude atmospheric air, and the contents of one were heated nearly to boiling as soon as prepared. After standing for a period of from four to six weeks, the supernatant liquid, treated with slight excess of sodium hyposulphite to remove iodine, failed to give any blue colour with ferro- or ferrieyanide of potassium, indicating complete precipitation of iron.

Assuming that the sugar present exerted a retarding influence on the reaction, a similar series of experiments was conducted on an aqueous solution of ferrous iodide; but as this method did not expedite the process, the saccharine solution was again resorted to. It was observed that the liberation of iodine was more rapid in presence of increased proportion of chlorate, but that the rate of decomposition was most accelerated by heat, while in all cases the total amount of iodine set free was approximately the same. The iron remaining in solution during the gradual precipitation continued entirely in the ferrous condition, while the precipitate at all stages of the process proved to consist entirely of hydrated ferric oxide, quite free from acidulous radicals.

A further study of these changes by means of quantitative determinations convinced the author that the reaction in the main occurs in accordance with the following equation:—



In conclusion, the importance is pointed out of physicians bearing in mind the incompatibility of syrup of iodide of iron with potassium chlorate.

The Quantitative Analysis of Syrup of Iodide of Iron. By Parker. (From a paper read before the Pharmaceutical Society, April 21, 1880, and printed in the *Pharm. Journ.*, 3rd series, vol. 10.) The study of the reaction forming the subject of the foregoing article suggested its application as a method for estimating the components

of syrup of iodide of iron. The ordinary volumetric and gravimetric processes for determining the amount of iron present are rendered more or less inconvenient or entirely inapplicable by the presence of sugar. The British Pharmacopœia does not mention its quantitative analysis, but, tacitly assuming that no loss occurs during its preparation, says, "It contains 4·3 grains of iodide of iron in 1 fluid drachm," which is a theoretical deduction from the amount of iodine taken and the volume of syrup produced.

Numerous attempts were made to obtain a solution or syrup of iodide of iron of known strength, by using definite quantities of iodine, but with all precautions some loss was incurred from decomposition of the iodide. Syrups carefully prepared by the author and commercial samples were therefore used to test the value of contemplated processes.

Of the various methods tried, the following was adopted by the author as the best :—

Estimation of Iron.—Into a 200 c.c. flask put 2·0 grams K Cl O_3 , 60 c.c. standard hyposulphite, and 40 c.c. diluted syrup (= 10 c.c.), boil gently for five or ten minutes, pass while hot through a very fine filter, rinse the flask once with boiling water, and filter; wash the precipitate from the filter into the flask, dissolve it by heating with dilute H Cl , precipitate with excess of Am H O , wash the precipitate, dry, ignite, and weigh as $\text{Fe}_2 \text{O}_3$.

Estimation of Iodine.—Deliver 20 c.c. diluted syrup into a plain glass retort containing 2·0 grams K Cl O_3 . The neck of the retort should pass quite to the bottom of a flask containing about 2·0 grams of K I and enough water just to cover the end of the retort; the flask must be immersed in a jar of cold water. Distil until nearly all the iodine has passed over, change the flask and water surrounding it, and continue the process until the distillate passes over colourless. Mix the distillates and titrate with standard hyposulphite.

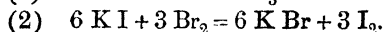
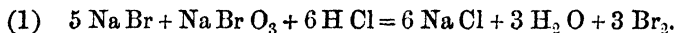
In order to form an idea of the extent of loss incurred by this iodine estimation, several trials were made by distilling 40 c.c. standard iodine, and titrating the distillate, with the following results :—39·86 c.c., 39·43 c.c., and 39·5 c.c., or a loss per cent. of 0·35, 1·42, and 1·25 respectively.

The author's analysis of a number of specimens of syrup of iodide of iron, show that in a syrup made in strict accordance with the directions of the Pharmacopœia the quantities of iron and of iodine present approach very nearly the amounts deduced from theory. Such a preparation is always slightly straw-coloured. A colourless

syrup, made by mixing the simple syrup with a solution of ferrous iodide previously kept in contact for some length of time with an excess of metallic iron, always shows a deficiency in iodide of iron, especially if the excess of iron thus employed be reduced iron instead of iron wire. This loss is probably due to the precipitation of a basic compound during the prolonged action of the excess of metallic iron on the solution of ferrous iodide.

Estimation of Iodine in Varec. O. Schott. (*Zeitschr. für analyt. Chem.*, 1879, 443.) The method recommended by the author is as follows:—50 grams of the dried and powdered varec are repeatedly exhausted with hot water, and the united solutions made up to a litre. 100 c.c. of this liquid are slightly acidulated with sulphuric acid, allowed to stand in a warm place for twenty-four hours or until the sulphuretted hydrogen liberated from the sulphides is completely removed, then concentrated by evaporation to about one-third of its volume, and the filtered residue distilled with the addition of ferric sulphate. The iodine thus passing over is received in solution of potassium iodide contained in a U tube, which is kept cool by immersion in cold water, care being taken that the delivery tube reaches several millimetres below the surface of the potassium iodide solution. After the whole of the iodine has distilled over, its quantity is carefully determined by titration with sodium hyposulphite.

Volumetric Estimation of Iodine by means of Permanent Standard Solutions. G. Allary. (*Bull. de la Soc. chim.*, 1879, 273.) The process suggested by the author is based on the following reactions:—



The standard solution employed is one containing bromide and bromate of sodium (or potassium) in the relative proportions expressed in the first equation. It is prepared by saturating solution of sodium hydrate with bromine, evaporating the mixture to dryness, and dissolving 3 grams of the perfectly dry but not ignited residue in sufficient water to make up one litre. The exact strength of the solution is determined by adding it slowly from a burette to 10 c.c. of solution of pure potassium iodide, containing 1.308 gram of K I per litre (.001 gram of iodine in each c.c.), and previously acidified with pure hydrochloric acid and mixed with mucilage of starch, until the colour of the mixture has changed from blue through red and cinnamon-brown to pale yellow.

This standard solution has the advantage of remaining unchanged on keeping.

Preparation of Pure Hydriodic Acid. C. Winckler. (*Schweiz. Wochenschr. für Pharm.*, 1880, 54.) The author dissolves iodine in carbon bisulphide in a tall cylinder, covers the solution with a stratum of water, and passes sulphuretted hydrogen through the iodine solution, until its colour has changed from violet to yellow. The hydriodic acid thus formed is dissolved in the supernatant water, while the liberated sulphur dissolves in the carbon bisulphide. After removing the solution of hydriodic acid from the latter, it only requires boiling for a few minutes to expel the excess of sulphuretted hydrogen, and is then quite pure. The acid obtained in this manner is recommended for the preparation of pure iodides.

Analysis of a Mixture of Chlorides, Bromides, and Iodides. A. Guyard. (*Bull. de la Soc. chim.*, 1879, 301.) The solution containing the chloride, bromide, and iodide is slightly acidified with dilute sulphuric acid, and treated with an excess of solution of copper sulphate and acid sodium sulphite, which completely precipitate the iodine as cuprous iodide. The filtrate is freed from sulphurous acid by boiling with an excess of sulphuric acid, and then heated with chromic acid in a flask connected with several Varrentrapp and Will's bulbs, which contain sulphurous acid and are kept cool by immersion in water. The bromine absorbed in the bulbs is then estimated as silver bromide. The chlorine is determined in the residue as silver chloride, after reducing the chromic acid with sulphurous acid. The quantity of iodine is calculated from the weight of the cuprous iodide obtained in the first part of the process.

Detection and Determination of Chlorine in Presence of Bromine and Iodine. G. Vortmann. (*Chem. News*, xli., 280.) The author has discovered a method by means of which even small quantities of chlorine along with the other halogens can be easily and quickly detected. It depends on the different behaviour of the chlorides, bromides, and iodides with peroxides of manganese and lead in presence of acetic acid.

Iodides are partially decomposed by the above-mentioned peroxides, even in neutral solutions, and if they are boiled with the addition of acetic acid the iodine is completely eliminated. Lead peroxide oxidises a part of the iodine to iodic acid, but with manganese peroxide no iodic acid is formed.

In a neutral solution bromides are not decomposed either by manganese- or lead-peroxide. In an acetic solution the lead peroxide

only acts, bromine escapes, but bromic acid is formed only if bromides are present in considerable quantities. Manganese peroxide has no action in the acetic solution, even on prolonged heating.

Chlorides are not attacked by either of the peroxides in the presence of acetic acid. In testing for chlorides in presence of bromides or iodides it is sufficient to boil the substance in an acetic solution with lead peroxide till the liquid on settling is colourless, and has not the slightest odour of bromine or iodine. The bromine and a part of the iodine escape as such; the remainder of the iodine remains as lead iodate along with the excess of the lead peroxide. On filtering and washing the precipitate, all the chlorine is found in the filtrate free from bromine and iodine. In this manner the chlorine may be determined quantitatively. If the quantity of chlorine accompanying the iodine is considerable, manganese peroxide is preferable to lead peroxide, as otherwise the liquid must be largely diluted with water to prevent lead chloride from depositing. In determining large quantities of chlorine in presence of bromine, it is well to add along with the lead peroxide some potassium sulphate, so that all the chlorine may be found in the filtrate combined with potassium.

In order to expel the liberated bromine and iodine more rapidly a moderate current of air may be passed through the solution on the water-bath.

Action of Oxalic Acid on Chlorates, Bromates, and Iodates.

A. Guyard. (*Bull. de la Soc. chim.*, xxxi., 299.) Chlorates, bromates, and iodates are decomposed on boiling with a supersaturated solution of oxalic acid. Iodates thus treated evolve the whole of their iodine in the free state; bromates part with most of their bromine, leaving a portion of this element in the residue in the form of bromide; while chlorates yield free chlorine, together with a large proportion of chloride. In the case of a mixture of these salts, the chlorate is decomposed first, the bromate next, and the iodate last of all; and these reactions follow each other in such a manner that the decomposition of each salt is complete before that of the next begins.

Vapour-Density Determinations of Inorganic Bodies at High Temperatures. V. and C. Meyer. (*Ber. der deutsch. chem. Ges.*, xii., 1112 and 1195.) The authors publish a modification of their process for the determination of vapour-densities (*Ber.*, xii., 609), which is to be employed in the place of the original process in cases when the temperature exceeds red heat. The vessel used for the determination is made of glazed porcelain, the substance itself

being contained in a small cup made from the stem of a Dutch clay pipe. The vessel is first cautiously heated in an ordinary muffle furnace, and then transferred to a muffle heated by a Perrot's gas furnace. Before introducing the substance, the air in the apparatus is displaced by a current of nitrogen. If care be taken to ensure the gradual cooling down of the furnace, the same porcelain vessel may be employed for several determinations.

The authors record the following results of determinations made by their processes :—

	Density found above Red Heat.	Density Calculated.
Sulphur	2.17	2.21 for S_2
Cuprous Chloride	6.93	6.84 „ Cu_2Cl_2 3.42 „ $CuCl$
Arsenious Anhydride	13.78	13.68 „ As_4O_6 6.84 „ As_2O_3
Cinnabar	5.39	Splits up into its constituents.
Stannous Chloride	12.85 and 13.08 .	13.06 for Sn_2Cl_4 6.53 „ $SnCl_2$
Zinc Chloride	4.53 „ 4.61 .	4.70 „ $ZnCl_2$
Ferric Chloride	11.14 „ 11.01 .	11.23 „ Fe_2Cl_6
Antimonious Oxide	19.98	19.90 „ Sb_4O_6 9.95 „ Sb_2O_3
Cadmium Bromide	9.22 and 9.28 .	9.40 „ $CdBr_2$

The correct formula of arsenious anhydride is, therefore, not As_2O_3 , but As_4O_6 ; that of antimonious oxide, not Sb_2O_3 , but Sb_4O_6 ; that of cuprous chloride, not $CuCl$, but Cu_2Cl_2 ; and that of stannous chloride, not $SnCl_2$, but Sn_2Cl_4 .

The Behaviour of Chlorine at High Temperatures. V. and C. Meyer. (*Ber. der deutsch. chem. Ges.*, xii., 1426.) The authors' determinations of vapour-densities at high temperatures have led to some remarkable observations respecting the effect of different temperatures on the density of chlorine. While the specific gravity of oxygen was found to be constant at all temperatures, that of chlorine exhibited very considerable variations, as may be seen from the following results :—

Specific gravity of Chlorine at 620° C.	2.42 and 2.46
„ „ „ at 808° . . .	2.21 „ 2.19
„ „ „ at 1028° . . .	1.85 „ 1.89
„ „ „ at 1392° . . .	1.66 „ 1.67
„ „ „ at 1442° . . .	1.65 „ 1.66
„ „ „ at 1567° . . .	1.60 „ 1.62

The specific gravity of chlorine calculated from the molecule Cl_2 is 2.45. Its molecular weight calculated from the specific gravities would thus be 71 up to 620°C ., but only two-thirds of this value at about 1500° .

In the authors' opinion these results point to the non-elementary character of chlorine.

Iodine shows a similarly anomalous behaviour at high temperatures.

Mercuric Iodide. H. Köhler. (*Ber. der deutsch. chem. Ges.*, xii., 608.) By recrystallizing mercuric iodide from hot strong hydrochloric acid, this preparation is obtained in large crystals, which are perfectly pure.

The pure salt melts at 253°C ., forming a blood-red liquid. In Gmelin's handbook the melting point of mercuric iodide is given as 238°C .

Purification of Mercury. V. Meyer. (*Ber. der deutsch. chem. Ges.*, xii., 437.) Mercury may be readily purified by allowing it to run in a thin stream through a solution of ferric chloride contained in a long tube, the lower end of which passes into a cylinder containing pure mercury, so that it reaches below the surface of the metal. This cylinder is provided with a side tube, through which the purified mercury flows off.

Action of Hydrochloric Acid on Mercuric Sulphide. E. Teuber. (*Chem. Centralbl.*, 1879, No. 34.) It is generally supposed that mercuric sulphide is not acted upon by hydrochloric acid. The author finds, however, that both the amorphous black sulphide and vermilion are more or less attacked by it, according to the duration of contact and the temperature and strength of the acid.

The products of the decomposition are mercurous chloride, sulphuretted hydrogen, and free sulphur.

Hydrobromic Acid as a Delicate Test for Copper. H. Endemann and G. A. Prochaska. (*Journ. Amer. Chem. Soc.*, 1879, 525.) A solution of cupric bromide is blue; if the same is evaporated, the solution turns at first dark reddish brown, leaving finally the anhydrous bromide as an almost black mass. The dehydration can also be produced by the addition of a concentrated solution of hydrobromic acid; if, therefore, to a dilute solution of a copper salt concentrated hydrobromic acid is added, a dark brownish red or violet colour is at once produced. This reaction is so delicate that $\frac{1}{100}$ mgrm. of copper can be detected with certainty. One drop of a solution containing the small quantity of copper is placed on a watch glass, then one drop of hydrobromic acid is

added, and the solution is then allowed to evaporate slowly by standing the glass in a warm place. When the whole has been concentrated to about one drop, this will distinctly show a rose-red colour. The colour thus produced is about three or four times as distinct as the one which is obtained by the addition of ferrocyanide of potassium. Of other metals which were examined in this direction, none but iron is likely to interfere with this reaction, and this only when present in considerable quantity. This reaction may also be utilized as a colorimetric test for the quantitative determination of small quantities of copper.

Qualitative Separation of Copper, Bismuth, and Cadmium. M. Iles. (From *Pharm. Zeitung*.) Potassium ferricyanide precipitates copper, bismuth, and cadmium from slightly acid solutions. On gently heating the precipitated ferricyanides with an excess of potassium cyanide, copper and cadmium pass into solution, while the bismuth is left undissolved as a white flocculent precipitate. A portion of the filtrate may now be tested with an excess of hydrochloric acid for copper, in the presence of which the acid will produce a brownish-red precipitate. The addition of ammonia and ammonium sulphide to the remaining portion of the filtrate, followed by the application of a gentle heat, will reveal the presence of cadmium by the formation of a yellow precipitate of cadmium sulphide.

Analytical Researches on Cobalt and Nickel. Dr. G. Papasogli. (*Chemical News*, xli., 74.) If a strip of zinc is plunged into a solution of the double cyanide of nickel and potassium, we observe suddenly, or in a short time, that it is covered with small bubbles which gradually increase and form a continuous gaseous envelope, whilst upon the zinc nickel is deposited in the state of a black powder, and around it there are produced dense clouds formed by an intensely red liquid.

This liquid is the solution of a new salt of nickel in potassium cyanide, having a greater density than the medium in which it is found, and descending to the bottom and slowly increasing it colours the whole mass of the liquid a blood-red.

On attentively observing the progress of the reaction, it was seen that the coloration reached a maximum limit at which the double cyanide must have undergone a complete modification, but the compound which is formed becomes modified in its turn, since the coloration slowly decreases in intensity and finally disappears altogether. The author considers that in this experiment the red colour which is developed depends on a new combination of cyanogen and

nickel produced by the reduction which the cyanogen undergoes from the action of the nascent hydrogen evolved when a small particle of the metal is deposited upon the slip of zinc. This opinion is confirmed by the following experiment:—On causing a solution of the double cyanide of nickel and zinc to be traversed by an electric current, and taking care to keep the two platinum rheophores separate, so as to observe separately the action of the oxygen and the hydrogen, there was observed at the negative pole where hydrogen was evolved a reddish coloration, more or less intense according to the quantity of nickel present; whilst at the positive pole there was no coloration. This experiment shows that the zinc takes no part in the reaction, but is merely a means of evolving hydrogen. The same result is obtained if aluminium is applied in place of zinc.

If the experiment which has been made with the double cyanide of nickel and potassium is repeated with a double cobaltic cyanide, it is seen easily that the reaction above mentioned is peculiar to the former metal.

If a slip of zinc is immersed in a solution of the double cyanide of cobalt and potassium, the metal becomes covered with a black powder and a gaseous envelope, but there is not the slightest coloration. If such a solution is traversed by an electric current, it remains colourless at the negative (Zn) pole, but assumes a maroon coloration at the positive (Cu), due probably to para-cyanogen mixed with an oxide of cobalt.

The author next sought to ascertain if the presence of cobalt injures the reaction, preventing it altogether or rendering it less sensitive. He finds that it is totally unaffected, and that on experimenting either with the slip of zinc or with the electric current, it is possible to detect 0.0005 of nickel mixed with an excess of cobalt. In such delicate researches it is necessary to operate upon very concentrated solutions.

There is no want of characteristic reactions for the detection of cobalt and nickel when they are separate from each other, nor for the recognition of cobalt in the presence of nickel. But there is more difficulty in establishing the presence of traces of nickel occurring together with a large proportion of cobalt; for although nickel, when alone, displays very salient characteristics, they are all masked by the presence of cobalt.

In a note on the alkaline polysulphides as reagents for cobalt, the author made known that on treating a solution of the double cyanide of cobalt and potassium with any of these polysulphides there is pro-

duced an intense red coloration, peculiar to cobalt, upon which the simultaneous presence of nickel has no appreciable influence.

The author proposes the following method, based upon these two reactions, for the recognition of cobalt and nickel :—

To an acid solution of the two metals is added a slight excess of a solution of the hydrate of potassium, to precipitate the metals in the state of basic salts. The precipitate is allowed to settle, the alkaline liquid decanted off, and the deposit repeatedly washed to remove the excess of potassa. A few drops of ammonium chloride and of ammonia are then added, and it is heated in a slight excess of potassium cyanide.

Care must be taken, as far as possible, not to stir the solution of the double cyanide, to prevent the absorption of atmospheric oxygen. If the double cobalt solution is converted into cobalti-cyanide, the addition of an alkaline polysulphide no longer produces the red coloration mentioned above.

The solution of the cyanides is then divided into two portions. To the first are added a few drops of the ammonium polysulphide, so that it may form a stratum above the cyanide solution. If in the plane of contact of the two liquids there is observed a red coloration, this indicates the presence of cobalt. The reaction is independent of the presence of nickel, and is sensitive to the fourth and even the fifth decimal place, if only the solution is highly concentrated.

In the other portion of the solution is immersed a small slip of zinc : if the liquid contains nickel there will be observed, besides the gaseous envelope, an intense red coloration, which shows itself over the whole surface of the slip, but especially at the lower part. The presence of cobalt does not interfere with this reaction, which is still produced even if the solution containing the cobalt has absorbed oxygen.

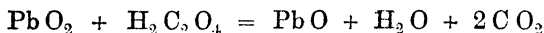
If the solution is concentrated the sensitiveness of the reaction extends to the fourth decimal place. The presence of ammoniacal salts in excess retards, or even prevents, the reaction.

The solution of potassium cyanide used should be concentrated, but an excess in quantity should be avoided, especially if the quantity of nickel is small. If an excess of the cyanide is used, then, on immersing the slip of zinc, there occurs suddenly a strong evolution of gas, which disperses the red coloration and makes it difficult to perceive the reaction.

To avoid this inconvenience, the author places in the solution to be examined a slip of platinum, joined at one extremity to a slip of

zinc. The greater portion of the gas then envelopes the platinum, and as the red colour forms only around the zinc, it is less readily dispersed, and the reaction remains more sensitive.

Analysis of Red Lead. F. Lux. (*Zeitschr. für analyt. Chem.*, xix., 153.) A weighed quantity of the sample is heated with dilute nitric acid until the decomposition is complete, and standard solution of oxalic acid is then added to the boiling liquid until the whole of the precipitated lead peroxide is dissolved. The action of the oxalic acid on the peroxide occurs in accordance with the following equation:—



One molecular weight of oxalic acid, therefore, dissolves one molecular weight of Pb O_2 . The quantity of peroxide thus found is calculated for $\text{Pb}_3 \text{O}_4$.

The author finds that commercial red lead contains besides $\text{Pb}_3 \text{O}_4$ 2–40 per cent. of free Pb O , and 1·4–13·5 per cent. of other impurities.

Presence of Lead in Glass-Wool. M. Battandier. (*Journ. de Pharm. et de Chim.*, 1879, 55.) As glass-wool is now frequently used for the filtration of liquids likely to corrode paper filters, the author draws attention to the frequent presence in this substance of lead, which it readily yields to strongly acid or alkaline liquids passing through it, and which, therefore, may give rise to serious errors in analyses.

Artificial Manganese Dioxide. A. Görgen. (*Comptes Rendus*, lxxviii., 796.) Manganese nitrate, when gradually heated to 155–162° C., and maintained at that temperature for twenty-four hours, yields crystals of manganese dioxide resembling polyanite in all their physical properties.

Preparation of Potassium Nitrite. H. Müller and C. Pauli. (*Archiv der Pharm.*, xiv., 245. From *Journ. Chem. Soc.*) After reviewing the various processes proposed for the preparation of potassium nitrite, the author gives the preference to Persoz's method (*Dingl. polyt. Journ.*, clxxiii., 75). The reason why it is so rarely employed, is the difficulty and cost of preparing the finely divided copper by the dry distillation of copper acetate, but this objection has been overcome by the use of the copper precipitate, obtained by decomposing a solution of copper sulphate with zinc-dust. The latter is made into a paste with water, and added in portions of 10 to 15 grams at a time to a moderately concentrated cold solution of copper sulphate. Much heat is developed by the reaction, so that

it is necessary to cool the mixture in order to avoid decomposition of the copper salt by the zinc oxide always present in zinc-dust. When the solution becomes almost colourless, the zinc must be added cautiously and gradually, until there is a slight excess, and the whole of the copper is precipitated. After decanting the solution of zinc sulphate and washing the precipitate once with boiled water, it is treated with dilute hydrochloric acid, to remove zinc oxide and traces of metallic zinc. As the finely divided copper oxidizes rapidly, it must be washed in the cold with boiled water, excluding the air as far as possible, and after draining off the water, it is mixed in the moist state with finely powdered potassium nitrate (10 parts nitrate to every 25 of copper sulphate originally taken), and dried rapidly with constant stirring. The mixture is then projected in small portions at a time into a crucible heated to low redness; the reaction is complete as soon as the fused mass becomes pasty, when a fresh portion may be added, stirring occasionally with an iron spatula. The mass is removed from the crucible while still soft, and when cold extracted with water; the clear solution, after separation of the cupric oxide, is then neutralized with nitric acid, and the potassium nitrate present separated, as far as possible, by crystallization. The nitrite mixed with a little nitrate is obtained on evaporating the solution.

Borocitric Acid and its Salts. (*Schweiz. Wochenschr.*, 1880, 50, and *Amer. Journ. Pharm.*, 258.) Ed. Scheibe proved that citric acid forms with boracic acid a soluble compound, the two constituents always uniting in the proportion of 2 molecules of citric and 1 molecule of boracic acid. The corresponding proportions by weight are: 1 part by weight of boracic acid, and 7 parts of citric acid. Borocitric acid can be prepared either by adding the boracic acid, with constant stirring, to a solution of the citric acid in boiling water, or by adding the citric acid to the boracic acid suspended in boiling water, and continuing to heat until a complete solution is obtained, or by mixing both acids with water, and heating. On evaporating an aqueous solution of borocitric acid to dryness, a solid, amorphous, light grey mass is obtained, which readily dissolves in water and in strong alcohol. When subjected to dialysis it dialysed unaltered. While evaporating, some of the boracic acid volatilized with the water. By allowing a very concentrated solution of borocitric acid to evaporate very slowly, the acid was obtained as a decidedly crystalline fibrous mass. The crystalline borocitric acid differs from the amorphous only in being less compact and having a snow-white appearance; in all other respects it

closely resembles the amorphous acid into which it is soon transformed, even when kept in closed vessels. Both compounds are not altered by the air, unless the atmosphere is very moist, when they deliquesce. The borocitrates of the alkalies are permanent salts, soluble in water, while the salts of the heavy metals are partially soluble in water and partially insoluble, the boracic acid apparently not being combined very firmly. All salts of borocitric acid colour turmeric paper brownish red, and are decomposed by stronger acids, which separate the boracic acid. Potassium biborocitrate is the only salt which has been obtained in crystals so far.

Exsiccator for Carbon Bisulphide, Ether, Chloroform, and Benzene. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xii., 1,294.) These substances are extensively used as solvents, and in many operations require to be evaporated without the application of heat. As their spontaneous evaporation in an open vessel is objectionable on account of the character of their vapours, the author suggests the use of an ordinary desiccator in which sulphuric acid is replaced by crude paraffin. The liquids rapidly evaporate and are absorbed by the paraffin, forming solutions from which they can be readily recovered by distillation. Paraffin is capable of absorbing more than twice its weight of ether, and more than three times its weight of carbon bisulphide.

The Effect of Glycerin on some Chemical Reactions. A. Guyard. (*Bull. de la Soc. Chim.* [2], xxxi., 354.) It is well known that the precipitation of certain metallic hydrates by means of caustic alkalies is wholly or partially prevented by the presence of glycerin. The precipitate of chromium hydrate by ammonia, and that of copper hydrate by potash or soda do not occur in the presence of this substance; while on the other hand, the precipitation of bismuth hydrate by ammonia, and that of manganese by potash, are not interfered with. By adding potash or soda to salts of nickel or cobalt in presence of an excess of glycerin, the hydrates are partially precipitated if the viscosity be decreased either by the addition of water or by warming the mixture.

The author quotes a number of experiments showing that the prevention of the precipitation of hydrates in these and other cases is not due to any chemical action of the glycerin, but merely to its viscosity. Solutions of aluminium sulphate, ferric chloride, lead nitrate, or stannous chloride, when mixed with a large excess of glycerin, are not precipitated by ammonia; but on strongly acidifying such mixtures with hydrochloric acid, and again adding an

excess of ammonia, the precipitation of the hydrates takes place at once. In a like manner glycerin fails to prevent the precipitation of nickel, cobalt, or ferrous hydrate, by soda or potash, if the alkaline mixture be mixed with an excess of hydrochloric or sulphuric acid, and then rendered alkaline again by a further addition of the precipitant. The viscosity of the glycerin, in these cases, is modified by the presence of the salts resulting from the combination of the acids with the alkalies; and hence it ceases to prevent the precipitation.

Solubility of various Substances in Glycerin. T. Farley. (*Journ. de Pharm. et de Chim.*, 1880, 58.) The results of the author's experiments are as follows:—

1	part of Sulphur	is soluble in 2000 parts of glycerin.
1	„ Iodine	„ „ 100 „ „
1	„ Mercuric Iodide . .	„ „ 340 „ „
1	„ Mercuric Chloride .	„ „ 14 „ „
1	„ Quinine Sulphate .	„ „ 48 „ „
1	„ Tannin	„ „ 6 „ „
1	„ Veratrine	„ „ 96 „ „
1	„ Atropine	„ „ 50 „ „
1	„ Morphine Hydrochlorate	„ „ 19 „ „
1	„ Tartar Emetic . .	„ „ 50 „ „
1	„ Iodide of Sulphur .	„ „ 60 „ „
1	„ Iodide of Potassium	„ „ 3 „ „
1	„ Potassa Sulphurata	„ „ 10 „ „

The Percentage of Extractive Substances Soluble in Alcohol, as a Criterion of the Purity of Spices. M. Biechele. (*Correspondenzblatt des Vereins analytischer Chemiker*. From *Journ. Amer. Chem. Soc.*) The author employs the following method:—A flask of about 120 c.c. contents is fitted with a cork, through one of the two holes in which passes the stem of a funnel about 7 c.m. diameter; through the other a tube leading to the top of an upright Liebig's condenser. Five grams of the spice to be tested, previously dried at 30° C., are placed on a filter, which should not quite fill the funnel, covered with a disc of filter paper, and absolute alcohol poured through until the flask is half full. The funnel is then covered with an inverted funnel, the stem of which has been broken off, leaving an aperture, through which is passed the lower end of the condenser. The alcohol in the flask is heated to boiling, and maintained at that temperature until the prolonged percolation of the condensed alcohol through the spice has removed all soluble matters, and the filtrate is colourless. The filter, with its contents, is then partially dried at 100° C., the contents removed to a weighed

porcelain dish, thoroughly dried at 100° C., and again weighed. The volatile character of many of the extractive substances (essential oils, etc.) renders it impossible to estimate the residue from the evaporation of the alcohol. Proceeding by the foregoing method, the author has obtained the following percentages of extract from pure spices:—

	Per cent.
Cloves	33.50
Cassia Bark	26.60
Cinnamon (Ceylon)	23.90
Caraway Seed	33.87
Fennel Seed	38.20
Black Pepper	19.87
Long Pepper	37.00
White Pepper	16.87
Red Pepper	18.13
Coriander Seed	14.88
Star-anise Seed	25.68
Anise Seed	36.14
Clove Pepper	22.68
Mace	37.60
Nutmegs	32.70

Determination of Glycerin in Wine. M. Raynaud. (*Comptes Rendus*, 1880, No. 18.) The wine is evaporated to one-fifth of its volume, the residue freed from alkalies by precipitation with hydrofluosilicic acid and alcohol, the filtrate mixed with a slight excess of barium hydrate and a quantity of quartz sand, and the mixture evaporated to dryness. The dry residue is now exhausted with a mixture of pure ether and alcohol, the filtered solution allowed to evaporate, and the resulting glycerin dried in vacuo over phosphoric anhydride.

The Detection of Fuchsine in Wine. E. Geissler. (*Pharmaceut. Centralhalle*, 1880, 55.) One of the simplest modes of detecting this adulteration consists in the addition of an excess of ammonia to the sample, and the subsequent agitation with amyl-alcohol. The latter becomes coloured if fuchsine is present.

The author calls attention to the fact that fuchsine does not colour wines permanently, but is gradually precipitated by the tannin, and that in course of time it even disappears from the precipitate by decomposition. Wine in which fuchsine has been detected may thus prove to be free from this adulterant after it has been kept for several years.

Detection of Aloes in Beverages. H. Borntraeger. (*Journ. für analyt. Chem.*, 1880, 165.) The presence of aloes in elixirs,

liqueurs, beer, and other liquids may be detected by shaking the suspected sample with twice its volume of benzol, then separating the latter and adding to it a few drops of strong solution of ammonia. In the presence of an appreciable quantity of aloes, the liquor ammonia will assume a fine violet-red colour.

Koettstorfer's Process for the Determination of Foreign Fats in Butter. A. F. Dimmock. (*Pharm. Journ.*, 3rd series, x., 641.) This process, which appeared in the *Zeitschr. für analyt. Chem.* (1879, p. 199), is a volumetric one, depending upon the fact that different fats require different quantities of potassium hydrate for their complete saponification. The process consists in treating the butter with a measured quantity of an alcoholic solution of potassium hydrate, saponifying, then determining the amount of uncombined potassium hydrate present in the mixture by means of a standard solution of hydrochloric acid.

The solution of potassium hydrate contains 28 grams in 1 litre of alcohol, and the solution of hydrochloric acid 18·25 grams in 1 litre of water. The solutions should exactly coincide, *i.e.*, 10 c.c. of the hydrochloric acid solution should exactly neutralize 10 c.c. of the potassium hydrate solution, and should be verified from time to time. An alcoholic solution of phenol-phthalein (1 in 50), which in alkaline solution is of a rose-red colour, and colourless in neutral or acid solutions, is employed as an indicator. Two or three grams of the butter are weighed in a small beaker, and from 30 to 40 c.c. of the solution of potassium hydrate added, the beaker placed on a water-bath, and stirred until saponification is complete, when the beaker is covered with a watch-glass, and allowed to remain on the water-bath for fifteen minutes. About 5 c.c. of the solution of phenol-phthalein are added, and the liquid titrated with the standard solution of hydrochloric acid until the liquid is of a yellow colour. From the quantity of hydrochloric acid required the amount of uncombined potassium hydrate is calculated, and from that the amount of potassium hydrate combined with the fat. Koettstorfer found as the result of thirteen determinations of pure butter, that for 1 gram from 0·2215 to 0·233 gram of potassium hydrate was required for complete saponification. He also examined other fats by this process, and obtained the following results:—

1 gram of Stearin required 0·1888 gram of Potassium Hydrate.					
1	„	Olein	„	0·1900	„ „ „
1	„	Palmitin	„	0·2080	„ „ „
1	„	Lard	„	0·1970	„ „ „

Experimenting on these substances himself, the author obtained the following results :—

1 gram of Olein required 0.1930 gram of Potassium Hydrate.

1 " Palmitin " 0.2016 " " "

1 " Lard " 0.1960 " " "

As lard, beef-fat, dripping, tallow, olein, and margurin all require about the same amount of potassium hydrate, the average being represented by the number 0.1955, this number may be taken as the basis for calculating the amount of adulterant of a sample of butter. From the results obtained by Koettstorfer from pure butter, 0.2215 and 0.233 gram, the two extremes, the mean 0.227 is taken as a standard of pure butter. If x = the percentage of admixed fat, and n the amount in grams of potassium hydrate required for complete saponification, then—

$$(\cdot 227 - \cdot 1955) : (\cdot 227 - n) = 100 : x.$$

If, for instance, the sample of butter required .2016 gram of potassium hydrate, then—

$$(\cdot 227 - \cdot 1955) : (\cdot 227 - \cdot 2016) = 100 : 80.6.$$

The butter then contained 80.6 per cent. of admixed fat.

The Analysis of Butter Fat. F. P. Perkins. (*Analyst*, 1879, 142.) The author recommends the following method as a practical and accurate one :—

Weigh out 1 to 2 grams of purified butter fat, saponify in a beaker in the usual way, drive off the alcohol, cool, set free the acids by adding a cold saturated solution of oxalic acid in very slight excess, pass through a small filter previously moistened with water, wash the insoluble acids thoroughly, first by decantation with cold, and lastly with hot, water on the filter, make up the filtrate to 200 c.c., transfer 100 c.c. to a small retort connected with a condenser, and distil slowly until the *whole* has passed over, add a few drops of litmus solution, titrate with decinormal KHO , calculate the amount consumed by the volatile acids in 100 grams of fat, and translate to butyric acid, $\text{C}_4\text{H}_8\text{O}_2$. The insoluble acids on the filter are treated with hot alcohol, the fluid holding the acids in solution being received in a flask. The filter is washed with alcohol until it no longer reddens litmus, and the filtrate is made up to 100 c.c. with alcohol. Half of this is taken, coloured with a suitable indicator, and heated gently; decinormal KHO is run in, and the number of cubic-centimetres required for neutralization

noted. The second portion is similarly treated. The first experiment serves as a guide to colour, etc.; the number of cubic centimetres used is ascertained, and the amount required by the non-volatile acids in 100 grams of fat calculated. For the purpose of comparison with fats used as adulterants, it may, perhaps, be convenient to convert this to stearic acid, $C_{18}H_{36}O_2$.

The Testing of Olive and other Fixed Oils. E. J. Maumené. (*Journ. App. Science*, Feb., 2nd, 1880.) After experimenting with all the known methods for testing oils, the author finds the following calorimetric process to be the best,—

In a graduated cylinder, to hold 150 c.c., put 50 grams of oil, ascertain the temperature of the same, and add with a pipette 10 c.c. sulphuric acid, stir with thermometer for a few minutes, and note the highest degree of temperature.

Pure olive oil gives an increase of $42^{\circ}C$.

	Degrees.
50 grams Pineseed Oil . . . give increase of	43
„ Tallow Oil . . . „ „	41–43½
„ Ricinus Oil . . . „ „	47
„ Horsefoot Oil . . . „ „	51½
„ Oil of Bitter Almonds „ „	52
„ Oil of Sweet Almonds „ „	52½
„ Rapeseed Oil . . . „ „	58
„ Earth Nut Oil . . . „ „	67
„ Sesame Oil . . . „ „	68
„ Hemp Oil . . . „ „	98
„ Nut Oil . . . „ „	101
„ Liver Oil (Raja) . . . „ „	102
„ Cod (G. Morrhua) . . . „ „	102
„ Linseed Oil . . . „ „	103

Contributions to the Chemistry of Several Varieties of Wax. E. Hirschsohn. (*Pharm. Journ.*, 3rd series, x., 749.) This paper deals with the solvent action of alcohol, ether, chloroform, petroleum spirit, and alcoholic solution of potash on the various kinds of wax met with in commerce, and the behaviour of the solutions with solution of ammonia and with alcoholic solutions of lead acetate and of ferric chloride. It concludes with the following very useful summary in the form of a systematic course of analysis for distinguishing the principal kinds of wax :—

A sample of the wax to be examined is heated with ten times as much chloroform to boiling, and, when completely dissolved, cooled in cold water.

I. The chloroform solution remains clear after cooling.

A. Ether dissolves completely.

- (a) Alcoholic solution of ferric chloride gives with the alcoholic solution of the wax a precipitate insoluble on heating.

Wax from Myrica quercifolia.

- (b) Ferric chloride colours the alcoholic solution black.

Wax from an undetermined species of Myrica.

- (c) Ferric chloride colours brownish but gives no precipitate.

Wax from Myrica cerifera.

Wax from Orizaba.

B. Ether dissolves only a part—

A sample is boiled with ten times the quantity of alcoholic potash solution till saponified, and the soap heated with 100 volumes of water.

- (a) The soap is completely soluble.

Japanese wax.

- (b) The soap is partially soluble.

Beeswax; African beeswax.

II. The chloroform solution becomes cloudy on cooling.

- A. Alcoholic solution of acetate of lead gives with the alcoholic solution of the wax, after a few minutes' standing, a cloudiness.

Wax from stick-lac.

- B. Alcoholic solution of acetate of lead gives no cloudiness.

- (a) The ethereal solution of the wax becomes cloudy on the addition of an equal volume of alcohol.

Brazilian and Carnauba wax.

- (b) The ethereal solution remains clear.

Bahia wax.

The Detection of Bile Pigments in Urine. M. Masset. (*Journ. de Méd. de Bruxelles*, 1879, 446.) The author recommends the following test as more delicate than nitric acid:—

To about 2 grams of the urine contained in a test-tube are added 2–3 drops of concentrated sulphuric acid, and then a small crystal of potassium nitrite, taking care that the crystal does not adhere to the sides of the tube, but drops directly into the liquid. In the presence of bile pigments, green zones will thus be formed, and, after shaking, the whole fluid will appear distinctly green. The coloration remains for some time, and does not disappear even on boiling the mixture.

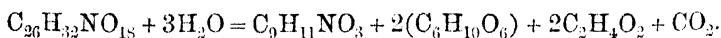
Estimation of Urea in Urine. J. Tattersall. (*Comptes Rendus*, lxxxix., 417.) The author finds that the results obtained by

treatment with sodium hypobromide are too high if the urine contains glucose, since the reagent evolves a considerable quantity of gas from the glucose. The greater the proportion of glucose, the greater will be the error in the urea estimation.

Indigo as the Predominating Constituent in a Renal Calculus. M. Ord. (*Berlin Klin. Wochenschr.*, 1879, 25.) The author received for examination from Dr. Bloxam a renal calculus which proved to consist of coagulated blood, a small proportion of crystallized calcium phosphate, and a considerable quantity of indigo. A powdered portion of the calculus, when mixed with an equal weight of sodium chloride, and heated with glacial acetic acid, yielded a deep-blue liquid, which, on cooling, deposited a shining, copper-coloured, crystalline sediment. Submitted to sublimation, the behaviour of this deposit was exactly like that of indigo.

Ignited in a platinum crucible, the calculus left a white ash consisting of calcium phosphate.

Indigo. E. Schunck. (*Journ. Chem. Soc.*, July, 1879.) In the first part of this paper reference is made to previous papers containing accounts of indigo-blue obtained from *Isatis tinctoria*, in which it exists in the form of a glucoside, indican; this, when treated with acids, splits up into indigo-blue and indigluclin. It is also decomposed by the action of caustic alkalies, a substance being formed which yields indigo-red, indifulvin, and leucine, when treated with acids. In some more recent experiments on indican from woad leaves, tyrosine has been found amongst the products of decomposition. The indican used consisted of a crude alcoholic extract of the leaves; it is therefore difficult to say whether the tyrosine existed ready formed in the leaves, or was the result of the decomposition of the indican; the latter is more probable, since tyrosine is almost insoluble in alcohol, and therefore would not be contained in the alcoholic extract in quantity. That there is some connection between indigo-blue and tyrosine is seen from the fact that tyrosine, $C_6H_{11}NO_3$, is indigo-blue, $C_8H_5NO + 2$ molecules of water, in which one atom of hydrogen is replaced by CH_3 . Its formation may be explained by supposing indican to split up into tyrosine indigluclin, acetic acid, and carbonic anhydride,—



In order to ascertain whether other indigo-yielding plants contain indigo-blue in the form of a glucoside, as in *Isatis tinctoria*, or in the free state, the following experiments were carried out:—

Polygonum tinctorium.—The leaves of this plant, which are large,

oval, and glossy, and of a lively green colour, contain a large quantity of the colour-yielding substance. On cutting them to pieces and rubbing with water to a thin paste, filtering through calico, and separating the chlorophyll, albumen, etc., from the filtrate by precipitating with lead acetate, a liquid is obtained which yields indigo-blue on the addition of sulphuric or hydrochloric acid and allowing the mixture to stand for several hours. The isolation of the colour-yielding substance is effected by the method formerly employed to extract indican from *Isatis tinctoria* or by the following, which is preferable. The leaves are dried in a stove, and while still warm, ground to a powder, and exhausted with alcohol in a percolator. The alcoholic extract is evaporated at the ordinary temperature, and the residue freed from chlorophyll and other impurities by precipitation with lead acetate. On adding basic lead acetate to the filtrate, a primrose yellow precipitate is thrown down; this is washed with water and with alcohol, and finally suspended in absolute alcohol, and carbonic anhydride is passed through the mixture until the liquid assumes a yellow colour. On evaporating the filtrate at the ordinary temperature and adding water, a portion remains insoluble. This is separated by filtration, and the lead in the filtrate precipitated with sulphuretted hydrogen. The clear solution, evaporated at the ordinary temperature by means of a current of air, leaves a syrupy residue, from which the colour-yielding substance is obtained as a yellow syrup on treatment with absolute ether and evaporation. It shows no signs of crystallization, is soluble in water, alcohol, and ether, the aqueous solution possessing a more or less acid reaction. It assumes a deep yellow colour when treated with caustic alkalies, and gives a light yellow precipitate with lead acetate. When it is mixed with sulphuric or hydrochloric acid, indigo-blue separates out, and the filtered solution gives the characteristic test for glucose with Fehling's solution. If, however, the aqueous solution is allowed to stand or is boiled, or mixed with caustic alkali and allowed to stand, no indigo-blue is deposited on addition of acid. In all probability the substance analogous to indican undergoes a molecular change, resulting in the formation of a body which yields indirubin and resinous matters on treatment with acids.

By allowing a large quantity of the aqueous solution to stand in contact with acids, indirubin and indifulvin are deposited, besides indigo-blue, showing that a portion of the substance undergoes some change, which in all probability may also take place in the cells of the leaf; for from leaves gathered late in the season a

substance is obtained which, when treated with acids, yields far less indigo-blue and more indirubin and other products than the substance obtained from the younger leaves.

From these experiments it is inferred that the leaves of *Polygonum tinctorium* contain a substance identical with the indican from *Isatis tinctoria*, and also that no colouring matter exists ready formed in the healthy living plant.

If the leaves of *Polygonum tinctorium* be crushed, and after a short time plunged into boiling alcohol, the bruised portion assumes an intense blue colour, whilst the other portion becomes white.

If the leaves be immersed in water and the water frozen, the portion of the leaves which have been frozen appears of a dark colour after complete thawing, and after steeping in boiling alcohol they assume a dark-blue colour, whilst the unfrozen portions become white. The fresh leaves, after being plunged in cold alcohol or ether, and extraction of the chlorophyll, appear blue; this was supposed to prove the pre-existence of the free colouring matter in the leaves; but by plunging them in boiling instead of cold alcohol, the colour-yielding substance is dissolved before it can decompose, and the leaves become of a pale yellow colour. Moreover, the alcoholic extract on evaporation does not deposit a trace of indigo-blue.

The explanation offered for these phenomena is as follows:—The molecules of the glucoside, indican, are in a state of unstable equilibrium, and are enabled to preserve that equilibrium so long as they are contained in the cells of the living plant. As soon as that vitality ceases the indican begins to decompose, and the molecules arrange themselves as their chemical affinities predispose them; the result is, indigo-blue and indiglucon. This reaction takes place so rapidly that in some cases it would appear as if indigo-blue pre-existed in the living plant. By immersing freshly cut sprays of *Polygonum tinctorium* in dilute hydrochloric acid for some days, and exposing them to the air, the acid is rapidly absorbed by the stalk, passing first to the lower leaves and then to the upper. The absorption of the acid is attended with a change of colour from dark green to dirty yellow, and after some time to dark blue, commencing at the base of the leaf, and gradually extending to the apex, which is reached only in the case of the lower leaves. When the change of colour begins to appear in the upper leaves, they are immersed in hot alcohol, whereby the chlorophyll is dissolved, leaving those parts which have changed colour blue, and the other portions white.

All these experiments were performed when the plants were in a state of vigorous growth.

The leaves of the *Polygonum tinctorium*, after developing the blue colour, present certain characteristic appearances.

1. The colouring matter is confined to the parenchyma of the leaves; the stem and ramifications in the coloured leaf may be traced as white veins on a coloured ground.

2. The younger leaves show more intense coloration, although probably all the leaves contain the same amount of colouring matter; but in the lower leaves it is more widely spread.

3. The colouring matter, when developed, is contained in the cells of the parenchyma in dots and parcels of various sizes, and in the amorphous state, the intensity of colour being determined by the crowding of the blue particles in the cells.

Bletia Tankervilleæ.—Similar experiments, made with the leaves of the *Bletia Tankervilleæ*, were attended with similar results, leading to the conclusion that these leaves contained a glucoside, similar to indican, which, on treatment with acids, yields a glucose and indigo-blue.

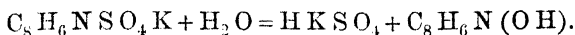
Indigofera tinctoria.—From want of material it was impossible to conduct experiments on this, the most important of all indigo-yielding plants; but according to P. Micheà, a glucoside exists in the indigoferas of India, similar to, and in all probability identical with, the indican from *Isatis tinctoria*.

From the following plants, supposed to yield indigo-blue, all attempts to obtain a body resembling indican have failed, and they show no indication of the presence of a colouring matter like indigo-blue. They are:—

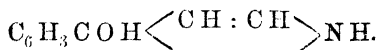
Galega officinalis,
Hedysarum Onobrychis (sainfoin),
Polygonum Tagopyrum (buckwheat),
Polygonum Persicaria,
Rhinanthus Christa Galli,
Sophora japonica,
Spelanthus oleracea.

Constitution of Indigo. E. Baumann and F. Tiemann. (*Ber. der deutsch. chem. Ges.*, xii., 1098–1104 and 1192–1195. From *Journ. Chem. Soc.*) The indican found in the urine of animals which have had indole administered to them is indoxylsulphuric acid. The chemical properties of this compound and its formation in the animal system, shows that it bears a strong resemblance to the phenol-

sulphuric acids. The potassium salt is decomposed by dilute hydrochloric acid, forming *indoxyl*, an isomeride of oxindole,—



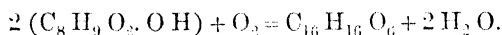
The constitution of indoxyl may be represented as



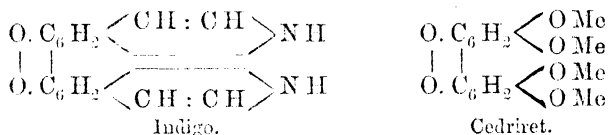
Indoxyl can easily be converted into indigo; for instance, indigo sublimes when potassium indoxylsulphate is heated. It also separates out in the crystalline state on the addition of hydrochloric acid to a mixture of potassium indoxylsulphate and ferric chloride, or any other weak oxidizing agent,—



This reaction is analogous to that which takes place when ethylic dimethylpyrogallate is converted into cedret by the action of ferric chloride,—



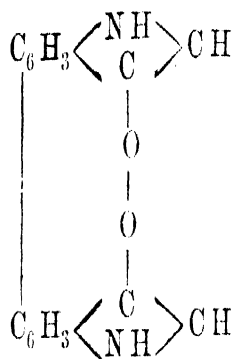
Liebermann has shown (*Ber.*, v., 746, and vi., 381) that cedret is a derivative of diphenyl-quinone; hence the authors conclude that indigo is also a diphenyl-quinone derivative, having the following constitution,—



In confirmation of the view, they have made some further investigations, especially as regards the relation of indoxyl to the decomposition products of indigo. Under certain conditions indigo yields tribromophenol and tribromaniline, but if indoxyl has the constitution generally ascribed to it, viz., $\text{OH}.\text{C}_6\text{H}_3 \left\langle \begin{array}{c} \text{CH} \\ \text{NH} \end{array} \right\rangle \text{CH}$, it could not give directly a body having the composition of tribromaniline, and yet experiment has shown that it does yield a tribromaniline (m.p. 119°). Consequently, the phenol nature of indoxyl is inadmissible, it being more probable that the OH group is not attached to the benzene nucleus, but to the side chain. This supposition is proved by the fact that potassium indoxyl sulphate, when heated with dry barium hydroxide, gives only aniline and neither amidophenol nor oxyanthranilic acid; further, the same substance, on

oxidation with potassium permanganate in dilute aqueous solution gives anthranilic acid.

Isatin chloride, $C_6H_4 \begin{smallmatrix} \text{CO} \\ \text{N} \end{smallmatrix} > CCl$, has been converted by Beyer (*Ber.*, xi., 1296; xii., 456) into indigo by reduction with zinc dust in acetic acid solution and subsequent exposure to the air. In this reaction, it is probable that indoxyl is first produced, and afterwards converted by the oxygen of the air into indigo, from which it would follow that indoxyl is $C_6H_4 \begin{smallmatrix} \text{C(OH)} \\ \text{NH} \end{smallmatrix} > CH$, and that indigo itself is probably—



This formula readily explains the analogy in composition of indigo and cedrret, the quinone nature of indigo, and the formation of aniline and anthranilic acid therefrom. It is, however, not decided whether the two indoxyl groups are united by the two benzene nuclei ($C_6H_5 \cdot C_6H_5$) or by the side chains ($C_6H_2 \cdot C_2H_2 \cdot C_2H_2 \cdot C_6H_5$).

MATERIA MEDICA.

PART II.

MATERIA MEDICA.

Fucus Vesiculosus. (*Lancet*, October 25th, 1879.) Of late a preparation known as “anti-fat” has been extensively advertised, both in this country and in America, as possessing remarkable powers of removing superabundant fat. This preparation is said to be a fluid extract of *fucus vesiculosus*, a common seaweed, known in this country as sea-wrack or bladder-wrack, and in France as *chêne marin* or *laitue marine*. It is largely employed on the coast of Scotland and France in the preparation of kelp; whilst in Ireland it is often used for feeding pigs. Like other seaweeds it contains small quantities of alkaline iodides.

Fucus vesiculosus was at one time officinal in the Dublin Pharmacopœia, and it is by no means a new remedy. Pliny describes it under the name of *Quercus marina*, and says it is useful for pains in the joints and limbs. In the eighteenth century it was largely employed by Gaubius, Aunel, Baster, and others, in the treatment of scrofula, bronchocele, and enlarged glands, and even for scirrhus tumours. Its charcoal, known as *Æthiops vegetabilis*, was used in the same class of cases. The fucus has also been found useful in skin diseases and asthma. On the discovery of iodine, in 1811, by Courtois, the saltpetre manufacturer of Paris, it for a time fell into disrepute. In the year 1862 its use was revived by Professor Duchesne-Duparc, who whilst using it experimentally in the treatment of psoriasis, found that it possessed the singular property of causing the absorption of fat.

The fucus can be taken either as an infusion, made by steeping half an ounce or a small handful in a pint of boiling water, or in the form of pill or liquid extract. The dose of the infusion is about a cupful, but it is so abominably nasty that few people can be induced to take it. The pills contain each three grains of the alcoholic extract; and, to begin with, one is taken in the morning, an hour at least before breakfast, and another in the evening, about three hours after dinner. The dose is increased by a pill a day, until the patient is taking ten every morning and evening. It is directed

that the ten pills should be taken *dans la même séance*, and that a greater interval should not be allowed to elapse between each pill than is necessary for the process of deglutition. The fluid extract may be given in drachm doses, and it is said that the best results are obtained when both the solid and liquid extracts are taken. A reduction in weight of from two to five pounds per week has been attained, but the medicine must be taken for some time before this reduction begins. Occasionally, however, the opposite effect is produced, and the patient gets stouter than ever; in fact, fucus has been recommended as an "anti-lean."

By some authorities it is stated that the fucus should be gathered at the period of fructification, about the end of June, and that it ought to be rapidly dried in the sun; whilst other and equally eminent authorities insist that it should be gathered only in September, and that it should be allowed to dry slowly in the shade; a high temperature, according to them, destroying its active properties. It is generally agreed, however, that the roots and stalks should be rejected, and that the fucus gathered on the west coast is superior to that of the east.

Nothing is known at present as to the mode of action of this drug.

Fucus Vesiculosus. M. Conroy. (From a paper read before the Liverpool Chemists' Association, Nov., 20th, 1879, and printed in the *Pharm. Journ.*, 3rd series, x., 433.) This paper contains an interesting *résumé* of the history and properties of this plant, from which we extract the following:—

Fucus vesiculosus, commonly known as bladder-wrack, sea-ware, sea-wrack, black-tang and kelp-ware, belongs to the great natural order of *Algæ*, and, as indicated by its name, to the genus *Fucus*. Greville applies to it the following special botanical characters:—*Frond* plane, linear, dichotomous, entire at the margin. *Air vessels* roundish-oval; in pairs. *Receptacles* mostly elliptical, terminating the branches.

The species is very variable; but the varieties pass so insensibly into each other that it is very difficult to strictly define them. Harvey says: "The first and most obvious distinction is in size; some fully developed specimens in fruit being found under an inch in length, while others reach several feet. Other varieties possess elongated air-vessels, or are entirely destitute of any; while others vary in the shape of the fructification, the receptacles being sometimes globose, sometimes ellipsoidal, and occasionally spindle-shaped. Lastly, the frond is frequently spirally twisted.

It is a perennial plant, and a native of the British shores, bearing the fructification in the spring. The root is an expanded, black, woody, callous disk. The frond is smooth and glossy, and in colour is a dark olivaceous green, furnished through its whole length with a darker coloured midrib, as thick as a goose-quill at the root, but gradually growing pale and thin. The vesicles, varying in size from a pea to a hazel nut, of thin substance, and their cavities filled with air, are found imbedded in the membranous part of the frond, near the midrib. The fructification consists of compressed, turgid, solitary or twin receptacles, perforated and filled with a pellucid mucus.

Fucus vesiculosus is the commonest and one of the most widely diffused species of the genus. It abounds on the coasts of our own islands, and along the shores of the northern Atlantic, extending to the tropics, and is said to have been found in the southern part of the ocean.

The uses made of this weed are manifold. In Northern Europe it is used as thatch and fuel, and when vegetation is scarce, or the land is covered with snow, it furnishes an abundant fodder for cattle, which regularly visit the shore, at the retreat of the tide, in search of it. The Norwegian and Lapland peasants collect and boil it, and when mixed with a coarse meal, feed their pigs, horses, and cattle with it. In Ireland and Scotland it is largely used for similar purposes, and it is said to be both grateful and nourishing to the animals, which become very partial to it. Formerly it was largely used in the manufacture of kelp, which is now used for the manufacture of iodine.

Some of its medical properties have been known from early times: the burnt plant, under the name of vegetable ethiops, having long enjoyed considerable celebrity in the treatment of broncocoele and scrofulous diseases, the dose being from 10 grs. to 2 drachms. Dr. Russel found the mucus of the vesicles an excellent resolvent, when externally applied to glandular enlargements and other scrofulous tumours. He also gave the expressed juice of the vesicles in glandular affections.

Since the discovery of iodine it has fallen into disuse for the treatment of these diseases, its place having been more effectually supplied by that agent and its salts.

According to Pereira, its organic constituents are cellulose, mucilage or carageen, mannite, odorous oil, with colouring and bitter matters. The mineral constituents amount to 16.6 per cent. of the dry fucus, and consist of chlorides and sulphates of sodium,

potassium, calcium, and magnesium, phosphates of iron and calcium, silica, and a small quantity of alkaline iodides not exceeding 0.25 per cent. As regards this proportion of iodides, E. Marchaud considers *Fucus vesiculosus* as one of the poorest species, and mentions that *Fucus digitatus* contains seven times as much.

After this sketch of the earlier history and uses of the sea-weed, Mr. Conroy refers to its recently acquired reputation in the treatment of morbid obesity, and quotes reports on this point lately published by M. Duchesne Dupare, Dr. Godeffroy, and Dr. Fairbank, all of whom speak very favourably of its action. He next proceeds to the pharmacy of this plant, giving in the first place formulæ for an extract and pills published by M. Dannecey in the *Journal de Pharmacie*, Nov., 1862. According to this writer the plant should be gathered during its period of fructification, and rapidly dried in the sun until it becomes sufficiently crisp to powder. The coarse powder is macerated for three days in four times its weight of alcohol of 86 per cent. It is then expressed, and the marc again treated in a similar manner with 54° alcohol. The tinctures are then mixed and filtered, the spirit recovered by distillation, and the extract evaporated to a suitable consistence. Of this hydro-alcoholic extract, which is one-fifteenth the weight of the dry plant, pills are made according to the following formula:—

Ext. Fuci. Vesic.	30 grams.
Pulv. Fuci. Vesic.	5 "

Mix and divide into pills of 25 centigrams each (3.75 grains). Three of these pills, he says, may be taken daily in the beginning, and gradually increased to twenty-four pills daily, a quantity which has often been attained without the slightest derangement of the stomach.

Mr. Conroy agrees with M. Dannecey as to the necessity of rapidly drying the fucus in the sun till it becomes crisp, if it is to be used in the dried state; for owing to careless drying it is often met with in a half rotten condition. He prefers, however, to work on the fresh plant, and thus avoid any risk on that score. Several experiments, made with the object of arriving at the relative values of the fresh and dried plant, gave the following average results:—

100 parts of fresh fucus dried under ordinary atmospheric influences, in summer weather, yielded 33 parts, nearly equal to one-third.

100 parts dried at 212° F., until it ceases to lose weight, produced 26 parts, or a little over one-fourth; therefore, for all practical purposes, we may say that 1 part of air-dried fucus is equivalent to 3

parts of the fresh plant, and that 1 part thoroughly dried at 212° F., is equivalent to 4 parts of the fresh plant. Using freshly gathered fucus, the following formula will produce a very fine fluid extract:—

Fresh Fucus Vesiculosus	7½ lbs.
Proof Spirit	1 gallon.

Thoroughly cut and crush the fucus, and macerate it for a couple of days in half a gallon of the spirit, then press, and repeat the process with the remainder of the spirit. Reserve 35 fluid ounces of the first liquor, distil the spirit from the remainder of both liquors, and evaporate to a soft extract. Dissolve this in the reserved 35 fluid ounces, make the measurement up to 40 fluid ounces with proof spirit, and filter after a few hours; 1 fluid ounce of this extract is equal to 1 ounce of the air-dried plant or to 3 ounces of the fresh.

For the solid extract use the same menstruum and exhaust as above, but evaporate the whole of the liquors to a suitable pilular extract. 1 part of this hydro-alcoholic extract is equal to 7·33 parts of the air-dried plant, or to 22 parts of the fresh.

To make these extracts from the air-dried fucus it would be necessary to use a menstruum consisting of 2 parts of proof spirit and 1 part of water, which would be equivalent to using proof spirit on the fresh plant; for it will be seen from the above formula that 1 gallon of proof spirit is used for 7½ pounds of the fresh plant, and, as this weight only represents 2½ pounds, or one-third of the dry plant, it is evident that the 5 pounds lost by drying should be added to the gallon of proof spirit, in order to have the same spirit-strength.

The author feels convinced that nothing is gained by the use of spirit of more than proof strength, since proof spirit fully extracts the fucus. Even a weaker spirit gives good results. Water is unsuitable, as it dissolves the carageen, thus producing a gelatinous liquid, which is not only difficult to work, but which produces a bulky and almost inert extract, owing to the very large amount of this mucilage which it extracts, and it is on this account that a spirituous menstruum is rendered necessary.

The action of *Fucus vesiculosus* is generally attributed to the iodine contained in it. The author does not doubt that its effects in scrofulous affections are due to this constituent, but points out that neither iodine nor any of its salts have as yet been observed to produce such results in the treatment of morbid obesity as those ascribed to this plant.

Lactucarium from *Lactuca Canadensis*. H. Flowers. (*Amer. Journ. of Pharm.*, July, 1879.) The milk-juice which exudes from this plant during its earlier stages of development is perfectly inert, though a large quantity is produced. As collected up to July 20, the exudation has a strong narcotic odour, while the palate perceives no bitterness, but simply a flat sweetish taste. Up to this time the plant has borne its reproductive organs, but failed in giving the requisite bitterness. A change, however, occurs about the end of July, at which time the laticiferous vessels are yielding a large supply of juice with a slightly bitter taste and a stronger and more lasting odour. As the season advances, both the bitter principle and the narcotic odour increase.

The milk-juice collected during the latter part of the season dried in irregular masses, crumbling into minute fragments when rubbed between the fingers, and was of a blackish brown colour, a strong odour and very bitter taste. If kept in a closely-corked bottle it remains soft and is capable of being moulded into cakes. The odour is slightly stronger in the fresh state, and the colour a greyish brown. Aubergier experimented upon this plant in 1843, and came to the conclusion that the lactucarium it yielded was devoid of bitter principle and worthless. Prof. Maisch, on the other hand, while examining this plant in 1867, obtained decided indications of the presence of a bitter principle, and of its medicinal activity.

The author's experiments were conducted with the milk-juice collected in September and October. Four drams of it were exhausted on a filter with boiling alcohol until eight ounces of filtrate were obtained. On passing through animal charcoal, and then concentrating by spontaneous evaporation, this filtrate yielded inodorous and tasteless needles, which melt at about 175° F., and congealed on cooling to a granular mass. They were evidently *lactucerin*. On still further evaporating the mother-liquor and adding to it water, a whitish precipitate was produced, from which the aqueous liquor was thoroughly drained. On dissolving the precipitate in boiling alcohol and evaporating the solution spontaneously, more of the tasteless needles were obtained, and pale brownish bitter scales, which were evidently impure *lactucin*.

The aqueous mother-liquor was precipitated by basic acetate of lead, and both the precipitate and the filtrate were freed from lead by sulphuretted hydrogen. On evaporating the solution, brownish amorphous masses, having a bitter taste, were left, corresponding to the *lactucic acid* and *lactucopierin* of the European lactucarium.

Lactucerin is soluble in boiling alcohol, light petroleum ether, and

chloroform, but only sparingly in cold alcohol; it is insoluble in water. It crystallizes in needle-shaped crystals, which melt at 175° , and volatilize when heated more strongly. It is charred by sulphuric acid, but nitric acid has no action on it.

Lactucin, which has a bitter taste, and is nearly insoluble in water, but soluble in alcohol and acetic acid. It crystallizes in scales, and is not precipitated from its solution by ammonia.

Lactic acid has an acid bitter taste, and is soluble in alcohol, but insoluble in petroleum spirit, ether, and chloroform; it has a brownish green colour.

Lactucopicroin forms a brown amorphous mass, having a bitter taste, soluble in alcohol, chloroform, ether, and water; it is not precipitated by lead salts.

The residue of lactucarium left after the separation of the above substances was treated with carbon bisulphide and other solvents, but no definite results were obtained.

The statement of Aubergier regarding the worthlessness of this plant is therefore undoubtedly incorrect, as there exist, beyond question, several bitter principles with decided physiological action. That author probably collected the juice before the plants were sufficiently matured, and the bitter principles developed.

Japanese Belladonna. E. M. Holmes. (*Pharm. Journ.*, 3rd series, x., 789.) Under the name of Japanese belladonna, a root has of late been repeatedly offered for sale in the European markets. The author's attention having been drawn to this drug, he has succeeded, with the aid of the recently published work by Franchet and Savatier on Japanese plants, to refer it to *Scopolia japonica* as its botanical source. This species of *scopolia* differs from the European one (*S. carniolica*) chiefly in its more acute leaves, which have constantly longer petioles, in the style being curved or declinate instead of straight, and in the teeth of the calyx being sometimes very unequal. The fruit is unknown. In size, the Japanese plant equals robust specimens of the European species.

The rhizome, as met with in commerce, varies in length from 2 to 4 or 5 inches, and on an average is half an inch in diameter, cylindrical or slightly compressed, rarely branched, knotty, and more or less bent and marked on the upper surface with circular, disc-like scars where the leafy stems have arisen. It is the slightly alternate disposition of the nodes from which these stems arise which gives the rhizome its knotty character. No rootlets remain attached to the rhizome, but each node is surrounded with one or more indistinct rows of dots or scars, apparently indicating their presence. The

rhizome is externally of a brown colour, not white when abraded, as in belladonna, of a pale brown colour internally, speckled with numerous very minute dots, which appear under a lens to be white and starchy, and scattered through a resinous or horny-looking structure. The bark is so similar in colour and so closely applied to the medullium as not to be readily distinguishable by the naked eye. The odour is slightly mousy and narcotic, and the taste hardly any except a slight bitterness. From portions which were mixed with the rhizome, it would appear to terminate in a genuine root of some length and thickness.



JAPANESE BELLADONNA ROOT.*

The left hand figure represents the root, the right hand one the twisted rhizome, and the central one a transverse section of the rhizome with the vascular bundles more marked than usual.

The author adds the following information respecting the genus *Scopolia*. It was founded by Jacquin on the peculiarity of the fruit, which is a capsule. The capsule, with the calyx and pedicel, fall off together, and after a time the capsule dehisces transversely, like that of henbane. In colour of the flower and in foliage the plant so closely resembles belladonna, that were it not for the fact that belladonna has a baccate fruit and no rhizome, even a good botanist might be led to call it an *Atropa*. The genus is named after Antoine Scopoli, an Idrian physician and professor of botany, who appears to have been the first to notice the European species.

* The woodcuts of this and subsequent illustrations were kindly lent by the Editor of the *Pharmaceutical Journal*.

The Japanese scopolia has the leaves often more or less deeply dentate, or even repand-dentate, in which character it presents an analogy to *Solanum nigrum* in this country, the leaves of which may sometimes be found quite entire and sometimes coarsely-toothed.

The Alleged Presence of Tannin in Gentian Root. Prof. J. M. Maisch. (*Amer. Journ. of Pharm.*, January, 1880.) The statements hitherto published with regard to the presence or absence of tannin in gentian root are very conflicting (see *Year-Book of Pharmacology*, 1876, p. 228; 1877, p. 217; and 1879, p. 496.) The last communication on this subject is a paper read at the Sheffield meeting of the British Pharmaceutical Conference by E. Davies, in which the presence of a trace (0.08 per cent.) of tannin (probably *gallo-tannic acid*) in recently dried gentian root was inferred from precipitates obtained in the infusion by gelatin, acetate of cinchonine, and tartar emetic, and from the distinct darkening of colour by ferric chloride. Mr. Davies also observed that the infusion of powdered gentian would only be slightly darkened by ferric chloride, and yield a faint precipitate with gelatin after long standing, and no precipitate with tartar emetic; and he therefore believes that this trace of tannin is liable to decomposition when the root is powdered and so exposed to oxidation, so that it cannot be regarded as a constant constituent of gentian root.

Desiring to examine the subject further, the author requested Mr. C. Baur to make a series of experiments in the laboratory of the Philadelphia College. The substances operated upon were an old sample of the root, a sample of concentrated infusion preserved by means of alcohol, and three samples of root of good and fresh appearance. The old root and infusion had been kept by the author for four years, while the other three samples of root were procured at the time the experiments were made. The infusion had deposited a precipitate of a pectin compound; filtered and freed from alcohol by evaporation, the liquid gave no precipitate with gelatin. The old root yielded by percolation with cold water a rather thick and opaque infusion, which produced a dark greenish black colour with ferric chloride, and a gelatinous precipitate with gelatin. But since the infusion could not be obtained perfectly transparent by filtration, and since alum solution would also precipitate it, it was diluted with about an equal bulk of water, when on standing over night a similar gelatinous precipitate of pectin separated, and the clear filtrate was *not* precipitated by gelatin, even after prolonged standing, and yielded only a very slight coloration on the addition of ferric chloride. A dilute infusion of the same root was left in

contact for over a week with a large piece of fresh hide, when ferric chloride produced merely a slight tint of the same intensity as in the beginning of the experiment.

The infusions prepared from two other samples of root were not affected by gelatin. The third sample apparently yielded a slight precipitate with gelatin on standing; but it was noticed that another portion of the same infusion, to which no gelatin had been added, likewise separated a precipitate similar in amount and appearance to that formed after the addition of the gelatin, and evidently consisting of a pectin compound. After removing this spontaneous precipitate by filtration, the liquid was not disturbed by gelatin, tartar emetic, or sulphate of cinchonine.

Since it was found impossible to procure gentian root, the clear infusion of which would give a decided precipitate with gelatin, further experiments were not made; but Mr. Baur has taken steps for obtaining recently dug gentian root from Europe, and expects to continue the investigation.

The author believes it is safe to conclude that commercial gentian root is free from tannin. The pectin present in the root is doubtless altered in the course of time, and possibly converted into the pectonic acid of Frémy, or a similar compound, which, while not entirely insoluble in water, becomes so in the presence of various salts, and probably also by gelatin and other substances. In separating from the imperfect solution, most of the yellow colouring matter is carried down with it; hence the gelatinous precipitate, after the mother-liquor has been drained off, acquires a deep greenish black colour on the addition of a ferric salt, and on account of the sparing solubility of the gentisic acid in water, needs copious washing with water to free it from this compound, after which it will not be coloured dark by the same reagent. In the same manner may also be explained the result of Mr. Ville's experiment with hide, and possibly the behaviour of the infusion observed by Mr. Davies with tartar emetic and the cinchonine salt.

Essential Oil of Aloes. (*Pharm. Journ.*, 3rd series, x., 613.) This oil was first discovered by Messrs. T. & H. Smith, of Edinburgh, in 1873. A specimen of it produced by this eminent firm of chemists was recently exhibited by Dr. W. Craig at a meeting of the North British Branch of the Pharmaceutical Society. It is a pale yellowish mobile liquid, of 0.863 specific gravity, somewhat resembling oil of peppermint in taste and smell. It boils between 266° and 271° C. It exists in aloes in exceedingly small proportion, only 2 fluid drams being obtained from five hundred pounds of

the drug. Its therapeutic qualities have not yet been investigated; but from its nature, Dr. Craig considers it likely to be an aromatic and anti-spasmodic.

The Effect of Intense Cold on Cherry-Laurel. Prof. Flückiger. (*Pharm. Journ.*, 3rd series, x., 749.) The author records some interesting experiments showing the influence of severe frosts upon the leaves of *Prunus laurocerasus*. These experiments lead to the conclusion that the source of hydrocyanic acid and benzylic aldehyde in these leaves is completely destroyed by intense cold. A minute quantity of an essential oil is still afforded by the leaves, but it does not agree with the oil as yielded by the living plant. Dried leaves are sometimes said likewise to yield no longer any hydrocyanic acid. The author is not able to confirm this statement, he having ascertained that fresh cherry-laurel leaves, dried for several days at the temperature of the water-bath, on distillation with water yielded a small amount of the said acid.

The Stigmata of Maize. (From the *Practitioner*, June, 1880.) Professor Castan has recently called attention to the stigmata of maize as a remedy which he has found to be of great use in gravel and nephritic colic. In the latter disease there ensued after the administration of the drug a marked decrease in the painful symptoms, and he therefore supposed that the stigmata acted less as a diuretic than as a local anæsthetic.

The different results which the use of the stigmata of maize has given at the hands of different observers appears to be due in large measure to the fact that the strength of the extract varies, according to the nature of the soil, to the climate, to the time, to the mode of picking, and to the manner of drying the stigmata. The formula for the preparation of the syrup is not yet fixed, since the quantity of the active principle varies in the different samples of the stigmata. The *Pharmaceutical Union* adopts formulæ which contain in one case six, and in another twelve grams of extract to the kilogram of syrup. The latter receipt is based on the assumption of a strength of 12 per cent. This quantity appears, however, to be too small, since the best samples of stigmata yield 25 to 30 per cent. of extract, or on an average 27·5. The kilogram of syrup will therefore contain 27·5 grams with this strength (27·5 per mille). The daily dose of the syrup will be two to four spoonfuls, representing about one or two grams of the extract. In all cases the syrup should be used in preference to an infusion of the stigmata of maize.

The Botanical Source of Araroba. Dr. J. M. de Aguear. (*Pharm. Journ.*, from the author's pamphlet "Memoria Sobre a

Araroba." Bahia, 1879.) The author has had an opportunity of fully examining the leaves and flowers of the araroba plant, and has thus been able to clear away the mystery hitherto existing as to the botanical source of the drug which, under the name of Goa powder, or araroba, attracted so much attention a few years ago.

The flowers and fruit obtained by the author show that the araroba plant is more nearly allied to *Centrolobium* than to *Caesalpinia*, having truly papilionaceous flowers, and that it belongs to the genus *Andira*, of the subtribe *Geoffraceae*, which is characterized by having a hard, drupaceous, one-seeded fruit, sweet-smelling, violet or purplish flowers arranged in panicles, a calyx with short teeth, and five distinct petals. From *centrolobium* it is distinguished by the fruit, which in that genus resembles a samara, and is furnished with prickles at its base. The bark of *Andira inermis* was formerly a well-known remedy for intestinal parasites, under the name of cabbage-tree bark or worm bark.

The following description is taken from the information contained in the author's pamphlet:—

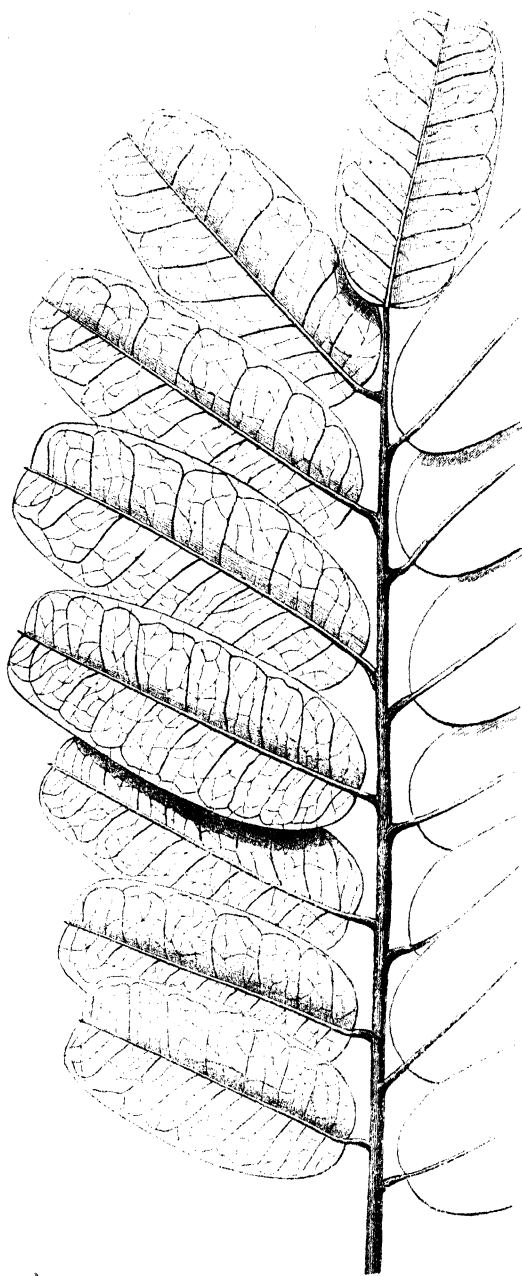
The plant from which araroba is extracted is one of the larger intertropical trees which are met with between 13° and 15° of latitude, south of Bahia, especially in the forests of Camamu, Igrapiuna, Santorem, Taperoa, and Valencia, and rivals in height the tree commonly known under the name of Oleo (*Myrcarpus fastigiatus*, or *Myrospermum erythroxylum*), and sometimes attains even greater dimensions. The ordinary height of the tree is 80 to 100 feet; the trunk is straight, cylindrical, and in the two specimens which were measured, in the thickest part one was 31 and the other 48 centimetres in diameter. The tree commences to branch at more than a third of its whole height, and forms a not very leafy head, having the form of a segment of a spheroid. The bark of the tree is not very thick, and appears to contain scarcely any of the active principle of the plant. The wood has a yellow colour, and is very porous, having numerous longitudinal canals visible to the naked eye, although these are more distinctly seen under a lens. The trunk in a transverse or tangential section presents lacunæ more or less large according to the age of the tree, and in these a pulverulent substance (araroba) is found, which in trees recently cut down, and before being dried, is of a light or pale tint, clearer than that of the wood. The medullary centre exhibits a canal different in appearance from the lacuna, having a diameter much more considerable. The young branches are entirely fistulose.

The leaves are alternate, compound, and paripinnate. The petiole

in two specimens which were measured, was in the one 32 and in the other 44 centimetres in length, having a variable number of pairs of stalked leaflets,—in one specimen 20, and in another 24. The leaflets are alternate and articulated, oblong, obtuse, entire, and emarginate at the apex, measuring from $2\frac{1}{2}$ to $4\frac{1}{2}$ centimetres in length, and from 1 to $1\frac{1}{2}$ centimetres in width. The distance between the points of insertion of the leaflets is about 2 centimetres, so that the leaflets only slightly overlap each other.

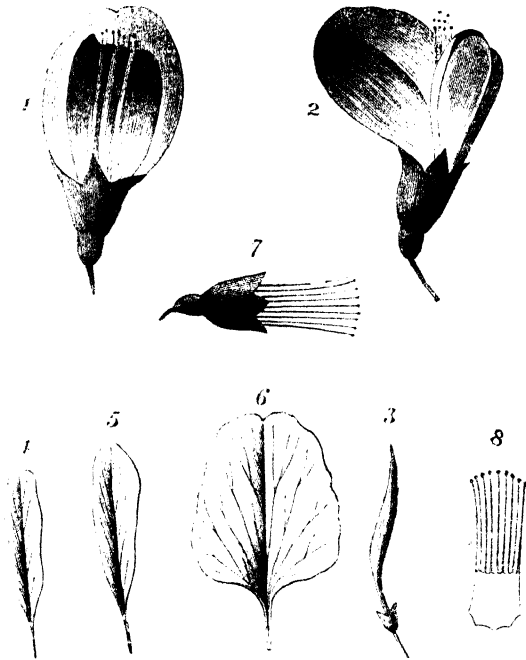
The common petiole or rachis is slender, convex on the under surface, and hollowed above into a small very smooth furrow; the secondary petioles, which measure about half a centimetre in length, are accompanied for a small distance by the rudiments of stipels. The leaflets are feather-veined, of a green colour on the upper surface, and of an ashy hue beneath. The inflorescence is centripetal, consisting of a panicle with a variable number of racemes, each of which consists, in the more luxuriant specimens, of about eight flowers or flower buds. The flowers are shortly stalked, alternately arranged, and are each furnished with a bract, which does not develop at the same rate as the flower, and hence the lower bracts appear smaller than the upper ones. The common peduncle is bare of flowers at the base for about a third of its length. The flowers are purple, papilionaceous, measuring $2\frac{1}{2}$ to 3 centimetres without the claw, which is about half a centimetre long. The *calyx* is gamosepalous, 2 centimetres long, covered with rusty-coloured hairs, a little flattened on three faces, like a triangular prism with rounded angles, the dorsal angle being the more prominent, and corresponding to the middle of the standard. The calyx is five-toothed, the two upper teeth being larger and longer, and separated by a more obtuse angle than the other three, which are equal, and of which two correspond in position to the wings of the corolla, and the central one to the keel.

The *corolla* consists of five clawed petals, the standard being entire, orbicular, about 2 centimetres in diameter, slightly emarginate at the apex, and furnished with a claw about half a centimetre long, and consisting in great part of the thickened middle vein of the standard. The alæ or wings are obovate, elongated, about 16 millimetres long by 6 broad, curved towards the base, and forming a longitudinal and oblique sinus (*gotteira*) near the top of the claw on the side opposite to the standard, the claw being about 7 millimetres long. The two petals forming the keel are similarly formed, but less curved, and 4 or 5 millimetres broad. The *stamens*, nine in number, are monadelphous and perigynous, about 2 centi-



LEAF OF *ANDIRA ARARоба*, SHOWING VENATION (NATURAL SIZE).

metres long, and adherent for about a third of their length, but having a slit opposite to the middle of the vexillum. The anthers are ovoid, with a longitudinal furrow on their inferior surface, in the middle of which the filament is inserted. The upper surface is convex and smooth. The *pistil* consists of a single carpel, and exceeds the stamens in length by 1 or 2 millimetres. The ovary,



FLOWER OF *ANDIRA ARAROEBA*.

1. Showing three lower teeth of calyx; 2. Corolla, lateral view; 3. Pistil;
4. Petal of keel; 5. Petal of wing; 6. Standard; 7. Stamens in situ, after removal of corolla; 8. Monadelphous stamens, separated from calyx.

which has a stalk about 4 millimetres long, is flattened at the sides, and presents two salient lines or rudimentary wings. The ovary and style (the latter for two-thirds of its length only) are covered with rusty hairs. The ovary is convex on the side opposite to the slit in the androphore, and concave on the side nearest to the two lateral wings.

The ovary is one-celled and one-seeded. The embryo is curved, and the seed exalbuminous. The arillus is short and tortuous.

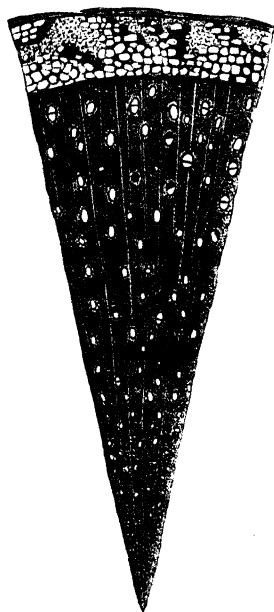
From the above description it will be seen that the araroba plant belongs to the Leguminosæ, and to the tribe of Dalbergiæ. It much resembles in some characters *Dalbergia miscolobium*, Benth., and *Andira fraxinifolia*, Benth. Neither of these two plants, nor the *Andira inermis*, has the obtuse emarginate leaflets which characterize the araroba tree.

The author believes the plant to have been hitherto undescribed, and proposes the name of *Andira Araroba*, Aguiar, for it, since the drupaceous fruit, paniced inflorescence, purple flowers, and the other characters above mentioned, clearly point to it being an *Andira*. This opinion is further strengthened by the fact that some other *Andiras* possess parasiticial properties, and that the natives, who call the *A. anthelmintica*, "Angelim de folha grande"; the *Andira fraxinifolia*, "Angelim doce"; and the *A. stipulacea*, "Angelim Coco"; also call the *A. Araroba*, "Angelim amargoso"; thus recognising a close alliance in the plants.

With regard to the production of the araroba, the author gives it as his opinion that it is formed by the oxidation of the resin which exists in great abundance in the tree, the oxidation being facilitated by the canals made by insects. He explains the presence of the larger cavities in the tree by the corrosive action of the araroba on the wood. He has not, however, as yet confirmed his theory by experiment. The araroba is collected throughout the year, the older trees being selected because the powder occurs in them in greater abundance. The trunk is cut into sections transversely, and these are then split longitudinally. The portions containing powder are then chipped or scraped off with an axe, which is done the more easily as the wood in these parts offers but little resistance. The colour, when freshly collected, varies from that of the flower of the cotton plant (pale primrose colour), becoming by the action of the air darker, to that of rhubarb, and finally dark purple. The commerce of this article is now chiefly developed in Camamu and Taperoa, although the tree exists in abundance in all the southern part of the Province of Bahia, and according to Drs. Bomfim and Agnello Leite, also in the forest of Sergipe. The tree is not cultivated, but propagates itself spontaneously.

The Histology of Araroba, or Goa Powder. T. Greenish. (From a paper read before the Pharmaceutical Society, April 7, 1880, and printed in the *Pharm. Journ.*, 3rd series, x. 814.) As met with in commerce, araroba is in the form of a powder more or less agglu-

merated ; mixed with it, and covered by it, are splinters of the wood in which this substance originates. The powder has an intensely bitter taste, and somewhat of a resinous adhesion to the fingers ; it is said that the colour is originally of a fine yellow, resembling sulphur, and that this by exposure gradually changes to a rhubarb colour, and then darkens to that of aloes. Occasionally in the commercial powder lumps are met with, which, when broken, show internally a canary colour, whilst the external parts are dark brown. A sample dried at 100–110° C. lost 1.98 per cent.



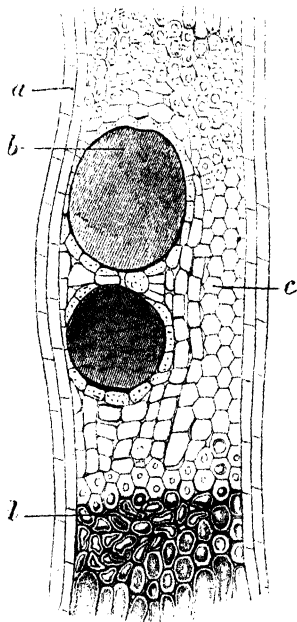
No. 1.—SEGMENT OF ARAROA.

The drawing No. 1 represents a segment of a transverse section of the wood yielding araroba, from an authentic specimen deposited in the Society's Museum, and the fragments of wood found in the powder, from sections of which other drawings were made, correspond with this in structure.

The bark externally is more or less covered with lichen, which gives it a somewhat grey and black patchy appearance. The epidermal tissue is for the most part thrown off by a suberous layer composed of a large number of cork cells compressed together and

forming a layer of dense tissue ; within this is a cellular tissue containing starch grains, and amongst these cells are sprinkled sclerogen or stone cells, cells much thickened by secondary deposit, and therefore, equally with the cork cells, capable of great resistance to external or internal destructive influences. The granular protuberances seen in a section of the bark are due to these sclerogen cells being left intact, whilst those containing the starch grains have to some extent given way.

With reference to the bark little need be said, as it does not

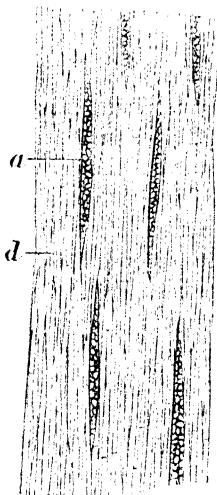


No. 2.—TRANSVERSE SECTION OF ARAROA, enlarged :—*a*, medullary rays ; *b*, porous vessels ; *c*, parenchyma of wood ; *d*, libriform cells.

appear to enter into the composition of araroba. Within the bark is the woody column traversed from the medulla to the bark by narrow medullary rays coloured by the araroba, and the round spots show the porous vessels, most of them also filled with the same substance.

The drawing No. 2 shows a small part only of the woody column of this segment, enlarged as seen under the microscope, and bounded on either side by the medullary rays. The whole segment of No. 1 being only a repetition of this section, an explanation therefore of

the cellular structure of this portion will give the cells comprising the whole. It exhibits four distinct forms of cells. There are the medullary rays (*a*) on either side, usually two cells wide, narrow, thin-walled, and elongated in a radial direction; (*b*) represents porous vessels, surrounded by the parenchyma (*c*) of the woody tissue, having some of its cells thickened and dotted; and (*d*) the libriform cells. This comprises the whole of the cell-tissue of the wood yielding araroba.



The drawing No. 3 is a longitudinal section through the medullary and libriform cells, showing the latter disposed in their length as elongated pointed cells; the several cells composing these tissues were isolated and identified.

In order to solve the question what tissues are involved in the formation of araroba, the author adopted a micro-chemical method, allowing solution of caustic alkali to run under a cover glass on the slide of moistened araroba, whilst under the microscope, and by this means dissolving away gradually the soluble portion of the powder; fragments of those cells just referred to as composing the several tissues were found and identified without difficulty. In this manner broken portions of libriform cells and of porous vessels, also of cells of the parenchyma of the wood, were discovered. Those of the medullary rays were too fragmentary to be distinguished satisfactorily; being a very delicate tissue, it was scarcely expected otherwise. In no single instance were cork cells present, or any of

the sclerogen cells before referred to as forming part of the bark; starch, although found in the cells of the parenchyma of the bark, was not detected in any sample of araroba examined. It is fair to infer, therefore, that the bark does not form any portion of the araroba, although in some samples of it pieces may be found, just in the same manner as pieces of wood; also that from the fragments of the cells in the araroba, which were obtained by the process just mentioned, the conclusion may be arrived at that the whole of the cell tissue comprising the woody column, from within the bark to the medullary, is involved in the decomposition which results in the formation of araroba.

In the next place the author deals with the physical condition of this substance immediately resulting from the destruction of tissue. The araroba was found to have permeated more or less, and imbued with colour all the tissues, even those which retained their form, but it filled many of the porous vessels; and whilst examining under a high power the deposit in one of these vessels, remains of cell tissue were visible, so disposed as to convey the impression that the deposit must have once been in a fluid condition; and subsequent examinations of sections from different pieces of wood, taken at random from a parcel of powder, presented other indications leading to the same conclusion. The libriform cells (*d*) on one part of the section, pressing closely upon each other, are in their outline sharply polygonal, whilst at the other they are separating, and show indications of having been subjected to some solvent action; the cells have lost their polygonal outline, and are gradually becoming loose and shapeless, and this is seen rather on the outside in contact with the powder, than in the interior of the wood. It is difficult also to understand how the porous vessels in the interior of the wood could have been so densely filled, unless the araroba had been in a fluid or semi-fluid condition. That its presence in these porous vessels is not due to decomposition of the vessels themselves is evident from the fact that when the contents are removed by solution, and the cell-wall examined, it is found to be intact. Did the araroba consist of finely comminuted cell tissue, the action of caustic alkali would little affect it; but the solution of about 80 per cent. proves that the cell tissue has been changed to some other substance soluble in caustic alkali. So far as these investigations go, they point to a fluid condition of araroba; whilst its presence in the clefts and hollow places of the wood, and the fact of more being found in old trees than in younger ones, must dispose at once of the idea of its being a secretion.

As to the cause of this formation, the author admits that there is no satisfactory evidence, but believes that araroba has its analogies in the gums and resins, which, according to the researches of Mohl, Wigand, Karsten, and Wiesner are due to a metamorphosis of the cell membrane and starch.

Digitalis Folia. C. Bernbeck. (*Pharm. Zeitung*, 1879, 506.) The author has made analyses of foxglove leaves of the first and second year's growths, proving that the former contain more pectin and pectose, but considerably less digitalin than the latter, and are therefore much less active. These results show the importance of strictly adhering to the directions of the Pharmacopœia with regard to the proper time for collecting these leaves. The author prefers the full-grown stem-leaves to the lower young leaves.

Narcotic Herbs. W. Brandes. (*Pharm. Zeitung*, 1879, 540.) The leaves of cultivated narcotic plants, owing to their size and fine appearance, are very generally preferred by pharmacists to the smaller and unsightly leaves of wild grown plants, and therefore command a much higher price. The author, however, points out that in such cases efficacy is sacrificed to appearance, as the leaves collected from wild grown plants during the period of inflorescence are by far the most active.

Palmella Cruenta. T. L. Phipson. (*Comptes Rendus*, lxxxix., 316-318.) *Palmella cruenta* is a small blood-coloured alga, which grows at the base of damp white-washed walls. In warm and damp seasons it bears a striking resemblance to coagulated blood. A microscopical examination shows that it is composed of minute round cells resembling blood corpuscles. These cells are about 0.004 mm. diameter, and float freely in a mucous liquid, which may be compared to the serum of the blood. They contain a peculiar rose-red colouring matter, which the author proposes to call *palmellin*.

In order to extract this substance, the plant is dried for thirty-six hours at the ordinary temperature, and is then covered with water. In this way a beautiful rose-coloured solution (orange by reflected light) is obtained, which, on evaporation at a temperature not exceeding 40°, yields a reddish blue, indistinctly crystalline mass. Palmellin strongly resembles hæmoglobin; like this body, it is insoluble in alcohol, carbon bisulphide, benzene, and ether. Its aqueous solution is coagulated by the addition of ammonia, alcohol, or acetic acid, and a precipitate resembling blood fibrin separates out.

The solution coagulates and loses its colour when heated to the

boiling point. Ammonium sulphide changes the colour to yellow, and hydrochloric and nitric acids change it to brick-red, without coagulating the solution. Salicylic acid destroys the dichroism of the solution, and alters its colour to a blue-violet. Palmellin exhibits one or two absorption bands between the yellow and the green portion of the spectrum. The ash of this body contains iron, calcium, and chlorine.

Colourless rhombic prisms analogous to hæmatin are obtained by adding acetic acid to palmellin.

When a solution of palmellin is exposed to a temperature of 25° for two or three days, decomposition sets in, and the liquid will be found to contain a large number of *vibriones*.

Note on Hyraceum. W. H. Greene and A. J. Parker. (*Amer. Journ. of Pharm.*, July, 1879.) Hyraceum is supposed to be the inspissated urine of the Cape Hyrax (*Hyrax Capensis*). According to Dr. Leidy (*Proceedings of the Academy of Natural Sciences of Philadelphia*, Dec., 1876), the hyrax is reported to inhabit gregariously rocky places at the Cape of Good Hope, and the accumulated urine in the hollows of rocks, gradually evaporating, is supposed to give rise to the product in question. It is reported as having been employed in medicine with the same effect as castoreum.

According to Professor Cope, "a substance resembling the concretion made by the urine of the hyrax was found in the fissures of the rocks of New Mexico, and is probably the fecal and renal deposit of the wild rat, *Neotoma*."

The authors' paper gives the results of an analysis of hyraceum. They describe it as a dark-brown, brittle, and resinous substance, having an aromatic odour and a bitter taste. About 56 per cent. of it is soluble in water, and nearly one-third of the residue from the aqueous extraction is soluble in alcohol, ether, and chloroform.

The soluble material amounts in all to about 70 per cent., and the remainder is composed of 14 per cent. of woody fibre and insoluble organic material, and 16 per cent. of sand and other inorganic substances.

On precipitating the organic material contained in the aqueous extract with lead acetate, and afterwards decomposing the suspended precipitate by means of sulphuric acid, a substance was obtained which constitutes the greater portion of the organic material soluble in water. It was hard, horny, and of a resinous character, transparent, and of a bright-brown tint. It probably consists of several substances, but the authors were unable to obtain a sufficient quantity for separation, and an ultimate organic analysis.

It gives out a fecal odour, and seems to be derived from fecal matter.

Traces of urea, together with uric, hippuric, and benzoic acids were found among the organic constituents of this drug. The authors also obtained a small quantity of a substance having a sweet taste, which was probably glyocol, derived from the breaking up of hippuric acid.

On ignition hyraceum yields about 34 per cent. of ash, containing a considerable proportion of lime and soda.

In the authors' opinion, hyraceum is undoubtedly derived from the urine of some animal; but the large amount of lime in proportion to the other salts, and the character of the organic matter indicate that it also contains fecal matter.

The amount of water in hyraceum is 7 per cent. The relative proportions of the constituents of the dried substance are as follows:—

Ash	34.15
Organic substances soluble in water . . .	37.44
Organic substances soluble in water, alcohol, ether, and chloroform . . .	14.54
Woody fibre and insoluble organic substances: residue	13.87
	100.00

<i>Ash.</i>	
Soluble in water	19.20
Insoluble in water	14.95
Potassa	2.95
Soda	8.95
Lime	6.00
Magnesia	2.10
Iron . . . . .	.12
Sand	2.00
Sulphuric Acid . . . . .	.60
Carbonic Acid	3.64
Phosphoric Acid . . . . .	.97
Chlorine	6.45
Traces of Nitric Acid, and loss . . . . .	.37
	34.15

Cusso. Prof. Arena. (*Pharm. Zeitschr. für Russland*, 1879, 655.) In the author's opinion, the efficacy of this drug is not due to koussin or kosin, but to the green bitter resin which the fresh powder yields to alcohol and ether. This resin gradually turns

yellow on exposure to the air, and in the course of this change of colour it also decreases in its bitterness and anthelmintic action. Hence the medicinal inferiority of the powder after it has been kept for some time.

Asphaltum and Amber from New Jersey. E. Goldsmith. (*Amer. Journ. of Pharm.*, July, 1879, from the *Proceedings of the Academy of Natural Sciences of Philadelphia*.) The author reports that he had received from Col. T. M. Bryan a specimen of asphaltum, a mass of which, weighing about 100 pounds, had been found in the ash marl, a layer above the greensand proper, about 16 feet from the surface, in the neighbourhood of Vincentown. It seems that this peculiar hydrocarbon had not been observed in the State of New Jersey before; at least no mention of it is made in the geological reports up to 1868. The specimen presented to the Philadelphia Academy had attached on one side a layer of the marl in which it was found.

As the material in question is properly considered a mixture of various hydrocarbons, it seems to be obvious that the properties vary according to the predominance of one or the other substance contained therein. This kind is very brittle, black, with a resinous lustre. Its fracture is uneven, inclined to conchoidal; the streak and powder appear brown. It melts easily in the flame, like wax, and burns with a yellow, smoky flame, leaving, after burning, a voluminous coal and but little ashes. In water, alcohol, and solution of caustic potassa, it is not soluble. It dissolves in chloroform and in oil of turpentine. In ether it dissolves with difficulty, forming a yellowish brown solution by transmitted, and a dirty greenish solution by reflected light. Oil of vitriol dissolves it into a black liquor, which, when poured into water, shows that a part of the substance is retained in solution, whilst another subsides as a dark-coloured powder. Nitric acid reacts on the substance at an elevated temperature, forming therewith soluble products of oxidation.

Not far from the pit from which the asphaltum had been obtained a specimen of yellow mineral resin was found. It occurs frequently in the marl of the cretaceous formation, but not regularly; sometimes hundreds of tons may be looked over without finding a single piece; at other times enough has been found to fill a barrel within a day. It is usually known under the name of amber or succinite.

It differed in several particulars from the typical amber found at the bottom and on the coast of the Baltic Sea. It was lighter than water, whilst the amber from the Baltic is specifically

heavier. The latter fuses into a thick, sluggish fluid, the Vincetown amber into a very mobile liquid; the cohesion of the Baltic product is stronger than in the specimen in question. These differences indicate its analogy to the variety of succinite called krantzite by C. Bergeman, who reported its occurrence near Neuberg, Germany.

It melts on heated platinum foil into a brown liquid, which runs like water. It takes fire easily, and burns with a yellowish, strongly-smoking flame, leaving but little carbon, which rapidly burns away and leaves a small quantity of dark-coloured ashes as a residue. Heated in a closed tube it melts and vaporizes into a grey cloud, which condenses easily into an oily liquid and some small crystals, which are probably succinic acid. The odour of the fumes is strongly penetrating, like acrolein. In water, alcohol, or ether it seems to be but sparingly soluble. In chloroform, bisulphide of carbon, and in oil of turpentine it dissolves freely. Oil of vitriol makes with it a red solution. Cold nitric acid seems not to affect it much. On warming the yellowish powder becomes orange-red. It is partly dissolved by caustic potassa. In this yellowish brown krantzite the author noticed on a fresh fracture a row of white crystals, arranged in radiating groups. The crystals were too small for mechanical separation, but the opinion was expressed that they were succinellite.

Podophyllum Resin. J. U. Lloyd. (From the *Proceedings of the American Pharmaceutical Association*.) Resin of podophyllum is found upon the market in colour ranging from light brown to deep yellow. Can these various shades be obtained from may-apple-root without the use of foreign substances?

At first resin of podophyllum was prepared by distilling all the alcohol from an alcoholic tincture of the root, and pouring the residue into cold water. It settled into a lump of dark brown colour; when pounded it was a little lighter.

In the present U. S. official process there is enough alcohol to cause the resin to separate in a finely divided form if the water be cold. Such an article has either a yellowish or slightly brown cast. The first portions of the percolate furnish the darkest shade. If it be dissolved in its weight of cold alcohol, filtered, and precipitated in sixteen parts of ice-cold water, it will be much lighter in colour, as impurities are thus separated which were mechanically carried down by the first precipitate. An article thus produced is a shade darker than powdered ipecacuanha, usually of a faint yellowish shade. As a rule, the nearer resin of podophyllum approaches white the better.

If instead of water, or water acidulated with muriatic acid, we use an aqueous solution of alum for the precipitant, the colour before mentioned quickly changes, acquiring in a few hours a rich greenish yellow. The supernatant liquid also turns yellow: this shade cannot be obtained with water, or water acidulated according to the Pharmacopœia. It results from a change in the resin, instead of the addition of another substance from the tincture.

Alum-water will scarcely produce an additional precipitate from the liquid after making officinal resin of podophyllum, but will change the powdered resin to greenish yellow, which shade, so frequently found in the market and so often demanded of manufacturers, the author has never been able to obtain without the use of foreign substances. Almost any of the colours, excepting that just named, from deep yellowish brown to nearly white, can be produced with pure water for the precipitant, as the variations result generally from impurities carried down by the precipitate or from resins of different densities.

Podophyllum. C. J. Biddle. (*Pharm. Journ.*, from a paper read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, October 21.) Collections of the roots were made in the months named below; they were washed, weighed, and carefully dried.

Mar. 3.	1000 grs., when dry weighed	220 grs.	Loss, 780 grs.
April 3.	1000 grs., " "	233 grs.	" 767 grs.
May 7.	1000 grs., " "	245 grs.	" 755 grs.
July 16.	1000 grs., " "	340 grs.	" 660 grs.
Oct. 12.	1000 grs., " "	317 grs.	" 683 grs.

It will be noticed by the above table that the weight of the dried root increases as the season advances until July is reached, when it is highest; it then begins to decrease, and in October it is much lighter.

A short description given of the plant at the times of the different collections may not be out of place here. In March, when the first collection was made, the plant had not made its appearance above ground, but the bud was waiting for the heat of the spring sun. In April it was just coming above ground; in May it was in bloom; in July the fruit was mature, with the next year's portion of the rhizome near its full growth; and in October the stem of the plant had died away, and the next year's rhizome, fully developed, including the rootlets and the bud, was seemingly waiting for spring to come,

The following table will show the yield of resin, etc. The root

was treated as directed in the U. S. Pharmacopoeia for *resina podophylli*.

It will be noticed that the washings for March and April showed different and more marked results with reagents than those of the three months that follow. All were treated in the same manner and subjected to the same influences. The author was unable to get a precipitate with Mayer's test with the mixed washings when they were dilute; so each washing was concentrated to about six fluid ounces, when a slight precipitate would show in the liquid near the top; in that of the three later months it could scarcely be seen.

	Yield of resin, in grs., from 1000 grs. of dried rhizome.	Colour of washing of resin.	Per-cent. soluble in ether	Washings react with						
				Mayer's test.	Phospho-molybdic acid.	Ferric chloride.	Ferrous sulphate.	Chlorine water.	Argent. nitrate.	Lead acetate.
March	49.30	Reddish brown.	89	Precip.	Precip.			Slight coloration.		Yellow precip.
April	52.40	"	84	"	"	Dark green.		"	Heavy white precip.	"
May	37.90	Light straw colour.	87	Very slight precip.	No precip.	No change.		Scarcely perceptible.	Dark brown.	Scarcely any precip.
July	28.30	"	90	"	"			"		"
Oct.	32.40	"	98	"	"			"		"

The resins obtained show scarcely any difference in colour, all being light coloured with the exception of that from the April root, which is a little darker than the others, probably due to the chlorophyll of the young buds.

In evaporating the alcoholic tincture of the rhizome, when it has been reduced sufficient to pour in the acidulated water, every lot had small globules of oil floating on the surface.

The washings of March and April were dark coloured, and on evaporating deposited a precipitate; those of May, July, and October were very light straw coloured, and also deposited a precipitate. This precipitate is probably a portion of the resin dissolved when it is washed, as a portion of the resin is soluble in water, and that which is dissolved is purgative.

One thousand grains of the dried rhizome were boiled with three portions of water and expressed, and the resulting decoction was evaporated to the consistence of an extract, which weighed 540 grains, over 50 per cent. soluble in water. The portion remaining after making decoctions was exhausted with alcohol and treated for

resin; but the yield was scarcely perceptible, not more than two or three grains.

The Supposed Alkaloid of Podophyllum. Prof. J. M. Maisch. (*Amer. Journ. of Pharm.*, Dec., 1879.) In a paper "On the Proximate Principles of some Berberidaceæ and Ranunculaceæ," contributed by the late Prof. Ferdinand F. Mayer to the *American Journal of Pharmacy*, 1863, pp. 97-100, the following sentences are found: "The rhizome of the may-apple contains both berberina and a colourless alkaloid, a resin, a free acid, a neutral odorous substance volatilizable in white scales, and saponin. When the alcoholic extract of the rhizome is freed from alcohol, and then mixed with water, the latter dissolves the acid, a considerable quantity of berberina and saponin, together with some resinous matter. The precipitate left after washing with water, the so-called resinoid podophyllin, is a mixture of a resin and the volatile principle, which are soluble in ether, and a portion soluble in alcohol, which is the other alkaloid in combination with saponin and brown resinous matter."

The various investigators who have since experimented with podophyllum, could either not discover any alkaloid at all, or observed only slight indications of its presence through the reactions with one of the general reagents for alkaloids, notably with Mayer's test liquid.

To throw further light upon this subject, the author made a careful examination of the concentrated washings of the resin prepared from the rhizome collected in March and April (No. 1), and also a similar liquor prepared from rhizomes collected in May, July, and October (No. 2), both of which had been placed at his disposal by Mr. Biddle.

Two samples were set aside for about a week, after which time both had separated a slight precipitate, and the clear liquids yielded no turbidity at all with Mayer's test. The liquid No. 1 was somewhat concentrated, allowed to cool, and filtered, when it was rendered turbid on the addition of the test. It was now evaporated to a syrupy consistence, and after standing for about two weeks, filtered from the resinous deposit (*a*), mixed with a little hydrochloric acid, and after twenty-four hours again filtered from the precipitate (*b*). The filtrate was rendered decidedly turbid on the addition of potassio-mercuric iodide. A portion of the acid liquid was agitated with ether, the remaining portion was first rendered alkaline by the addition of sodium carbonate, and then likewise treated with ether. In both cases, on the complete evaporation of the ether, a yellowish

amorphous mass, of a disagreeable odour, was left, which was agitated with dilute hydrochloric acid, the solution being afterwards again tested with Mayer's reagent, without producing the slightest turbidity.

The resinous deposit (*a*), was dissolved in a little alcohol, the solution filtered, the filtrate precipitated by cold water acidulated with hydrochloric acid, and on the following day again filtered. The clear liquid gave no reaction with potassio-mercuric iodide, until after it had been concentrated, cooled, and filtered. It was, however, noticed that the turbidity again disappeared after a short time, while on other occasions it remained. The cause for this different behaviour was only determined after many repetitions, and was found to be a slight increase of temperature caused by the radiating heat from a heated iron plate, or by the accidental exposure of the test-tube to the direct rays of the sun; in fact, the warmth of the hand was found to be sufficient for making the turbidity disappear entirely or partly. The cold liquid was now completely precipitated by Mayer's test; the precipitate, which was soluble in hot water, was well washed with cold water, dissolved in a little soda, and the solution acidulated with hydrochloric acid; on passing sulphuretted hydrogen through the solution, not the faintest indication of the presence of mercury could be discovered.

The precipitate (*b*) was boiled with water, and filtered while hot. On cooling the filtrate became turbid. It was again pressed through paper, acidulated, and now yielded no turbidity with Mayer's test, until after it had been further concentrated; the precipitate had precisely the same behaviour as indicated above.

The mother-liquor, No. 2, was concentrated and treated with ether and potassio-mercuric iodide; the results were identical with those obtained with No. 1.

None of the author's experiments indicated the presence of even traces of an alkaloid, and the cause of the precipitation by Mayer's test was therefore attributed by him to the slight solubility in water of podophyllinic acid, one of the constituents of the so-called resin of podophyllum, since even Klunge's test for berberine has proven its entire absence. To test the correctness of this supposition, two samples of podophyllinic acid, prepared from the well-washed officinal resin with hot water and with ether, were dissolved in hot water, the filtered solutions cooled, again filtered, and these filtrates treated with Mayer's reagents, both with and without the addition of hydrochloric acid; but in no case was any turbidity observed. The slight quantity of this resinous compound which remains dissolved in cold

water is equally soluble therein after the addition of some potassio-mercuric iodide; but it seems that some other constituent of the rhizome is capable of retaining for some time a somewhat larger portion of podophyllinic acid in complete solution, which is then precipitated by the test liquid mentioned, and perhaps by other salts, without, however, combining with the metal. Hence the clear mother-liquors, if tested shortly after the preparation of resin of podophyllum, may yield a precipitate with the test liquid, which would not be obtainable a few days later.

The Fruit of *Adansonia Digitata*. F. L. Slocum. (*Amer. Journ. of Pharm.*, March, 1880.) A short notice of the so-called "cream of tartar fruit" is contained in the *Amer. Journ. of Pharm.*, 1877, p. 254, and it is there stated to be probably distinct from the fruit of the Baobab, *Adansonia digitata*. Opportunity was afforded by Prof. Maisch to examine some of the pulp covering the seeds of the latter. When examined under the microscope, the dry pulp is seen to be destitute of crystalline structure. It readily falls to a yellowish white powder, and has a pleasant acidulous taste. The pulp of the cream of tartar fruit is of a darker colour and has a more acid taste. The pulp is soluble in hot or cold water, and the solution has an acid reaction.

The author's chemical analysis shows the presence of pectin, grape sugar, malic acid in the form of acid potassium malate, a crystalline principle not further investigated, and traces of calcium and of phosphates. Pectin is by far the predominating constituent of the pulp.

***Heracleum Giganteum*.** Dr. Gutzeit. (*Pharm. Zeitung*, 1879, 703.) The author distilled the unripe fruits of this plant with water, and found the distilled water to contain free ethyl and methyl alcohols. Water distilled from the unripe fruits of *Pastinaca sativa* also proved to contain these alcohols. Ethyl butyrate, and several solid hydrocarbons, belonging to the paraffin-group, were found among the constituents of heracleum oil. From the unripe fruits of both *Heracleum giganteum* and *Pastinaca sativa*, the author isolated a new crystalline substance, which he proposes to call heraclin. It forms star-like groups of white silky needles, which are odourless and tasteless, fusible at 185° C., and neutral to test paper. They are insoluble in water and difficultly soluble in ether, carbon bisulphide, and cold alcohol, but much more soluble in boiling alcohol, and still more so in chloroform. On exposure to the air they gradually turn yellow. The composition of heraclin is represented by the formula $C_{32}H_{22}O_{10}$.

Medicinal Properties of Quebracho Bark. Dr. F. Penzoldt. (*Berl. Klin. Wochenschr.*, 1879, No. 19. From *Med. Times and Gaz.*) The author narrates some experiments, both on man and animals, with a new drug, the bark of *Aspidosperma quebracho* (*Apocynaceæ*), sent from Brazil, where it is reputed to have antipyretic properties. The form of preparation used throughout was a watery solution of an alcoholic extract of the bark, ten parts of the latter being percolated with one hundred of alcohol for several days, and the liquid filtered, evaporated, dissolved in water, again evaporated to dryness, and the residue dissolved in twenty parts of water.

The main results obtained in frogs were complete motor paralysis of central origin, respiratory paralysis, and diminished frequency of the pulse, independent of irritation of the vagus. In rabbits and dogs, motor paralysis and dyspnoea, increasing with the dose administered were noticed. The dyspnoea in the rabbit, however, appeared to depend on retardation and deepening of the inspirations; while in the dog the inspirations were accelerated. In the latter, also, there was salivation.

Experiments on animals, rendered feverish by the injection of putrid fluids, showed no decided reduction of the temperature: and hence quebracho is probably not, as was supposed, an antipyretic. It should be added that it is not an antiseptic, but only temporarily retards putrefaction. The results obtained in actual cases of fever in men were also negative, but Dr. Penzoldt thinks that, considering the close chemical relationship between the alkaloid "aspidodermine," which Baeyer has extracted from quebracho bark, and quinine, the subject requires further working out in this direction.

By the accidental observation of a patient with pleurisy and emphysema, on whom the antifebrile effect of quebracho was being tried, Dr. Penzoldt was led to try the bark in various forms of dyspnoea, depending on emphysema, bronchitis, phthisis, pleurisy, etc., and obtained remarkably good results. A teaspoonful of the above-mentioned solution was given two or three times a day. The most marked objective phenomenon after its exhibition was a reddening of the previously cyanosed or livid tint of the lips and face. In a case of emphysema, where the patient was blessed with a nose the seat of acne hypertrophica, the ordinary violet-blue colour of the organ became fiery red, and excited the surprise of the other patients in the ward. The respirations generally became deeper and less frequent, and the patients expressed themselves subjectively much relieved. The first feeling after taking the drug was one of warmth in

the head; many said that they had less desire to cough, and that they found expectoration easier. Occasionally sweating occurred, and in some cases abundant salivation. No bad effects were noticed with the dose mentioned.

Dr. Penzoldt finds that the addition of quebracho solution to blood, in the presence of oxygen, makes it assume a bright red colour, and he is inclined to think that possibly the blood is rendered capable of taking up more oxygen than usual, and carrying it to the tissues. This is, however, merely a provisional hypothesis, and at present there is no satisfactory explanation of the fact that, while moderate doses of the extract alleviate dyspnoea in man, large doses cause dyspnoea in the lower animals.

As yet quebracho bark is not a commercial product, but the wood is imported in large quantities for tanning purposes. The action of an extract of the wood is similar to that of the bark, but weaker. The alkaloid aspidodermine affects the frog, on the whole, just as the extract of the bark does.

Tonga: A Reputed Remedy for Neuralgia. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, x, 849.) A paper was published in the *Lancet* of March 6th, 1880, by Professors Sydney Ringer and William Murrell, giving details of the use of tonga in eight cases of neuralgia, six of which were promptly cured, one was much improved, and in the other a week's trial of the remedy failed. The drug was brought to Professor Ringer by Mr. Ryder, a gentleman residing in the Fiji Islands, who described the drug as a mixture, and knew nothing of its botany, but stated that he and his friends had tried it extensively in neuralgic affections, and found it very successful.

Tonga, as placed in the author's hands, consisted of small loose bundles about the size of a small Florence flask, containing in the interior a mixture of bark, leaf, and woody fibre; the outer covering or wrapper consisted of the inner bark of the cocoanut tree. The following instructions were given for its use:—

“The bundle, without being unfastened, to be steeped in half a tumbler of cold water for ten minutes; then squeeze the liquid from the bundle back again into the tumbler, and take a claret-glass of the infusion three times a day, about half an hour before each meal; dry the bundle, and hang it up in a dry place to prevent it getting mouldy. It will answer for twelve months. Hot drinks and exposure to cold winds should be avoided whilst taking the medicine.”

The author's examination of this drug shows that it is composed mainly of a mixture of fibrous material, probably a root, and the inner bark of plants, the botanical sources of which are unknown.

Further, that the main constituents of the bark are pectin, glucose, a small quantity of essential oil, and fat; while the fibre contains some potassium chloride, and a volatile alkaloid which is probably the active principle. He suggests that for the present the alkaloid be called tongine.

The Botanical Source of Tonga. E. M. Holmes. (*Pharm. Journ.*, 3rd series, x., 889.) Having received a specimen of this drug from Mr. Gerrard for examination, the author observed that the fibrous portion showed an endogenous structure, and exhibited under the microscope a few prismatic raphides and a large number of starch granules, some of which appeared collected in small spheres. As the starch granules somewhat resembled in shape those of the common arum, the source of the drug was sought for in the order *Araceæ*. From a reference to Seemann's '*Flora Vitiensis*,' the genus of that family most likely to produce a stem like the fragments found in tonga was observed to be *Rhaphidophora*. On comparing the structure of a small cylindrical portion of Mr. Gerrard's specimen with the specimens of the plants of that genus in the Herbarium of the British Museum, it appeared to correspond with the stem of *R. Vitiensis*; and a microscopical examination of a fragment of the stem of that plant proved the starch granules to be of the same shape and size as those of tonga, and to present the same curious character of agglomeration into little spheres. The prismatic raphides and other features in the Herbarium specimen pointing to the same conclusion, the author has no hesitation in referring the fibrous portion of tonga to a species of *Rhaphidophora*, and believes this species to be *R. Vitiensis*, which Engler in his recent monograph makes a variety of *R. pertusa*, Schott.

The bark which is mixed with the stem in tonga appears to resemble in its sweet and slightly astringent taste that of monesia bark and the "sweet bark" of Queensland; both of these barks are derived from trees belonging to the *Sapotaceæ*, and it may be presumed the tonga bark is derived from some member of the same family. The fragments of leaves are of exogenous structure, and are probably added as a blind, since they differ from those of the two families to which the other drugs belong. These leaves being present in minute quantity only are often absent altogether from the packets of the drugs.

Simaba Cedron. Dr. H. Hager. (*Pharm. Centralhalle*, 1879, 435.) The seeds of *Simaba Cedron*, the cedron tree, are used in New Granada as a febrifuge, and as an antidote for the bite of poisonous snakes. They resemble almonds in appearance, and are commonly

known in New Granada and Central America as "cedrons." Fever patients eat the seeds cut into pieces the size of an ordinary pill. In cases of snake bite the seeds are cut into thin transverse sections, which are applied to the wound in addition to the internal treatment. Their efficacy as a fever medicine is attributed by the author to quassin, which is contained in them in considerable proportion.

Satureja Juliana. P. Spica. (*Gaz. chim. Ital.*, ix., 285-289. From *Journ. Chem. Soc.*) This plant, called "*erva de ibbisi*" in the Sicilian dialect, is used by the peasantry to prepare a decoction which is taken in cases of intermittent fever; it is an herbaceous plant of the labiate order, having an aromatic odour and somewhat pungent taste. In order to ascertain to what the active properties of the plant were due, the residue left on evaporating the alcoholic extract of the plant was washed with cold alcohol to free it as much as possible from chlorophyll, then dissolved in boiling alcohol, precipitated with an alcoholic solution of lead acetate, and filtered boiling. After separating the excess of lead by adding ammonium carbonate to the clear liquid, it was concentrated and precipitated with water. The substance was further purified by treating its alcoholic solution with animal charcoal and again precipitating with water. The white gelatinous product was separated by means of ether into two compounds, one of which, moderately soluble in ether (m. p. 204-205°), gave numbers agreeing with the formula $C_{34}H_{58}O_4$, or, with less probability, $C_9H_{16}O$. The more soluble substance acquires a greenish yellow tinge when boiled with dilute sulphuric acid, but otherwise remains unchanged: a minute quantity dissolves, but the solution does not reduce Fehling's test, although when evaporated at 100° it blackens and emits an odour between that of wax and caramel. This is only a preliminary notice, the author intending to examine the plant more carefully as soon as he can obtain a sufficient quantity.

A Volatile Alkaloid in *Æthusa Cynapium*. W. Bernhardt. (*Archiv der Pharm.*, 1880, 117.) According to Ficinus, *Æthusa Cynapium* contains a crystalline alkaloid, *cynapine*, while Walz found the alkaloid of this plant to be a volatile liquid. The author's results seem to confirm those of Walz. By distilling the crushed fruit of this plant with milk of lime, he obtained a reddish yellow liquid, floating like oil in the aqueous distillate. Both this oily liquid in alcoholic solution and the aqueous distillate possessed a strongly alkaline reaction, and an exceedingly penetrating, offensive odour, resembling the odour of rancid fish oil. The author considers the oily substance a volatile alkaloid, the formation of which

is analogous to that of trimethylamin from *Chenopodium vulvaria*, when treated similarly. He intends to further investigate its nature.

Coto Barks and their Characteristic Constituents. J. Jobst and O. Hesse. (*Journ. Chem. Soc.*, May, 1880.) Two kinds of coto bark are found in the market, both of which are exported from Bolivia; the one which was first examined comes from the interior of Bolivia, and from its resemblance to the true cinchona barks was called "Cinchono Coto." According to Wittstein, however, it would appear to be derived from some plant belonging to the Orders Lauraceæ or Terebenthinaceæ, rather than to the Rubiaceæ. The powder or tincture is used in cases of diarrhœa and colic, also for neuralgia, rheumatism, and gout. Another variety of coto bark, said to come from the shores of the Mapiri, closely resembles the other in appearance, but its physiological action is considerably weaker. It is called by the authors "Paracoto bark," and differs greatly from the true coto bark in its chemical nature, for although piperonylic acid is found in both, the cotoïn and dicotoïn contained in the true coto bark are absent in paracoto bark, being replaced by paracotoïn, hydrocotone, dibenzoylhydrocotone, leucotin, and oxyleucotin. As the two barks very closely resemble one another in appearance, and are sold under the common appellation of "coto bark," the crystallized cotoïn of commerce manufactured from them necessarily varies greatly in its physiological effects, according as it is prepared from the true or false coto bark, or mixtures of the two.

Cotoïn.—The method of preparing this compound, which is only contained in true coto bark, has already been described (this Journal, 1877, i., 480). Its melting point is 130° , and its solutions have no action on polarized light. The results of the analyses of the substance itself, and of the lead compound, correspond very closely with the formula $C_{22}H_{18}O_6$. The action of bromine in chloroform solution gives rise to *tribromocotoïn*, $C_{22}H_{15}Br_3O_6$; this crystallizes in yellow prisms (m. p. 114°), almost insoluble in cold water, but easily soluble in alcohol. *Triacetylcotoïn*, $C_{22}H_{15}\bar{A}c_3O_6$, is formed by the action of acetic anhydride on cotoïn at 170° ; it forms large prisms (m. p. 94°) easily soluble in chloroform, in ether, and in hot alcohol. Benzoic acid is formed when cotoïn is heated with concentrated hydrochloric acid at 140° , also when it is fused with potash.

Dicotoïn, $C_{44}H_{34}O_{11}$.—When the crude cotoïn is treated with boiling water, at first nothing but cotoïn crystallizes out from the cooled solution; but when the insoluble residue is treated again and

again with the mother-liquors, large plates make their appearance: these may be to a great extent separated from the cotoïn by means of a sieve, which retains the plates. When pure, it melts under boiling water, and is but sparingly soluble in it; by boiling with water, however, it appears to be converted into cotoïn. Dicotïn crystallizes in lustrous, almost colourless plates (m. p. 74–77°), easily soluble in alcohol, ether, and chloroform.

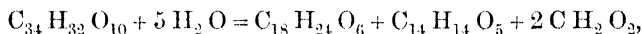
Paracotoïn, $C_{19}H_{12}O_6$.—This compound which melts at 152°, has already been described (see *Year-Book of Pharmacy*, 1877, p. 159). When bromine is gradually added to a chloroform solution of paracotoïn, it is at first absorbed, with evolution of hydrobromic acid; but on continuing the addition of bromine, a scarlet crystalline precipitate is formed, which, on being dried between filter paper becomes yellow, whilst hydrobromic acid continues to be given off. The analyses agree with the formula, $C_{38}H_{21}Br_3O_{12}$, but it is probably a brominated derivative of paracotoïn, as when gently heated with potash solution, it yields the characteristic odour of paracoumarhydrin, a substance produced on decomposing paracotoïn itself with potash (*loc. cit.*). *Paracotoïc acid*, as already noticed, is produced by the action of baryta water on paracotoïn, but may be more conveniently prepared by means of potash. The solution is first treated with ether to remove paracoumarhydrin, and the crude paracotoïc acid may then be precipitated with hydrochloric acid. When pure it melts at 108°; its barium, calcium, lead, and silver salts are yellow amorphous precipitates.

Leucotin, $C_{34}H_{32}O_{10}$.—When leucotin is treated with bromine in chloroform solution at the ordinary temperature, it yields *dibromoleucotin*, $C_{34}H_{30}Br_2O_{10}$, crystallizing in small white prisms (m. p. 187°), very sparingly soluble even in boiling alcohol, more soluble in ether or chloroform. When gently heated with excess of bromine in acetic acid solution for a long time, it is converted into *tetrabromoleucotin*, $C_{34}H_{28}Br_4O_{10}$ (m. p. 157°).

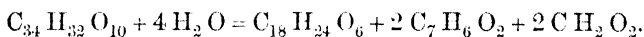
Cotogenin, $C_{14}H_{14}O_5$.—When leucotin is fused with potash, it gives off hydrogen, and the product contains benzoic acid, and small quantities of formic and protocatechuic acids, protocatechuic aldehyde, and cotogenin. In order to extract the latter, the solution of the fused mass is acidified with hydrochloric acid and treated with ether: the ethereal solution is then agitated with soda to remove the acids, and evaporated. The protocatechuic aldehyde and the cotogenin in the crystalline residue are separated by means of alcohol, in which the last-named substance is but sparingly soluble. After being purified by crystallization from boiling acetic acid,

cotogenin melts at 210° , but at the same time turns brown and decomposes; at a higher temperature, pyrocatechol distils over. When fused with potash, it is entirely decomposed into protocatechuic acid, whilst hydrogen is given off in abundance. Attempts to prepare a bromine-derivative of cotogenin were unsuccessful.

Hydrocotone, $C_{18}H_{24}O_6$.—When the fusion of the leucotin with potash takes place in a retort, an oil distils over which solidifies on standing. The hydrocotone thus obtained may be easily purified by distillation or by crystallization from alcohol, in which it is readily soluble, as well as in ether and in chloroform; it is but sparingly soluble in boiling water, and almost insoluble in potash solution. It forms colourless prisms (m. p. $48-49^{\circ}$; b. p. 243°). When gently heated with nitric acid, it is converted into *dinitrocotone*, $C_{18}H_{20}(NO_2)_2O_6$. This compound crystallizes in plates which explode when strongly heated. It dissolves in water, alcohol, and concentrated nitric or hydrochloric acid with a magnificent blue colour. The author considers hydrocotone to be a substance of the nature of a quinol, whilst dinitrocotone is probably a dinitro-derivative of the corresponding quinone. The formation of hydrocotone and cotogenin from leucotin may be represented by the equation,—



whilst the benzoic acid is produced thus,—



Oxyleucotin, $C_{34}H_{32}O_{12}$.—Protocatechuic acid is found amongst the products of the action of concentrated hydrochloric acid on oxyleucotin at 140° . *Dibromoxyleucotin*, $C_{34}H_{30}Br_2O_{12}$, and *tetrabromoxyleucotin*, $C_{34}H_{28}Br_4O_{12}$, are colourless crystalline substances melting at 190° and 159° respectively: they may be obtained by a process similar to that described for the corresponding leucotin derivatives. When oxyleucotin is fused with potash, it yields the same products as leucotin.

Dibenzoylhydrocotone, $C_{32}H_{32}O_8$, is contained in the crude leucotin, and is left undissolved on treating it with a small quantity of acetic acid. When purified by crystallization from hot acetic acid, it forms colourless prisms (m. p. 113°) easily soluble in chloroform, ether, or boiling alcohol. When fused with potash, it is in great part resolved into hydrocotone and benzoic acid, but some cotogenin is produced at the same time. *Dibromodibenzoylhydrocotone*, $C_{32}H_{30}Br_2O_8$, formed on adding bromine to an acetic acid solution of dibenzoylhydrocotone, crystallizes in colourless prisms

(m. p. 147°), and is converted into *tetrabromodibenzoylhydrocotone*, $C_{32}H_{28}Br_4O_8$ (m. p. 84°), by treating it with excess of bromine in chloroform solution.

Hydrocotoin, $C_{15}H_{14}O_4$ (*loc. cit.*), yields two bromine derivatives, of which *monobromhydrocotoin*, $C_{15}H_{13}BrO_4$, crystallizes in pale yellow needles and very short monoclinic prisms (m. p. 147°), whilst *dibromhydrocotoin*, $C_{15}H_{12}Br_2O_4$, forms sulphur-yellow six-sided prisms (m. p. 95°). *Acetylhydrocotoin*, $C_{15}H_{13}AcO_4$, obtained by the action of acetic anhydride on hydrocotoin at 150° , forms colourless crystals (m. p. 83°), which yield a crystalline monobrominated derivative (m. p. 196°). When heated with potash, hydrocotoin yields hydrocotone and benzoic acid.

The *etheral oil* obtained by distilling paracoto bark with water appears to differ somewhat from that existing in true coto bark. By fractional distillation, it was separated into five portions, two of which, named α - and β -paracotene, are hydrocarbons boiling at 160° and 170° respectively: the analyses, and the fact that they do not absorb hydrochloric acid, shows that they are not terpenes. The other three portions, α -, β -, and γ -paracotol, are oxygenated oils boiling at 220° , 236° , and 240° respectively. Full details of the physical properties and action of reagents on these five compounds are given in the paper.

In conclusion, the authors state that the various constituents of the coto barks may be arranged in three groups.

The first, or hydrocotone group, includes hydrocotone, which is a hexhydric alcohol, dibenzoylhydrocotone, leucotin, and oxyleucotin; the three last named yield cotogenin and hydrocotone when fused with potash.

The second, or cotoïn group, includes cotoïn, dicotoïn, and hydrocotoïn, which are distinguished by giving a dark brown-red coloration with ferric chloride in alcoholic solution.

The third, or paracotoïn group, contains but two members, paracotoïn and paracotoïc acid. Both these compounds give a deep yellow or brown-yellow coloration with concentrated nitric acid.

Besides these compounds, piperonylic acid, which had been already prepared by synthesis, exists ready formed in the bark, and also various oily bodies volatile in the vapour of water.

Spanish Opium. G. L. B. Pardo. (*El Laboratorio*. From *New Remedies*, June, 1880.) It may not be generally known that opium has been raised in Spain in various districts, and at different times. The author, who deplors the fact that at present the cultivation

appears to have dwindled down to the efforts of a single individual, says that opium was raised over forty years ago in Puente del Arzobispo, by a Mr. Yela, upon a ground situated on the banks of the Tajo; by Fernandez Izquierdo, in Navaclan; by Menchero, in Carthagena; by Dr. Orduna, in Cascante (Navarra), etc. But the principal cultivator of opium in Spain is Dr. José Pardo, in Torrecilla de Alcaniz (Teruel), who has been engaged in this work for many years. He succeeded once in persuading some farmers to begin the cultivation of the poppy; and the result appeared to realize his expectations, for he obtained in one year over thirty pounds or thereabouts of opium of excellent quality, all of which was gathered by women who had acquired a certain practice in collecting. This opium, which was generally put up in form of more or less rectangular pastils, of three to six ounces in weight, is compact, of a purely opiate odour, of a chocolate colour, a clear conchoidal fracture, very soluble in water, and very rich in alkaloids. In fact, it is so powerful that it more nearly corresponds to the commercial extract of opium.

It was analysed six or eight years ago, and its high percentage of alkaloids noticed, but, owing to the war then waging, the results were not made public. During the first year, when the above-mentioned farmers really produced what might be called a regular crop, it unfortunately happened that the price of imported opium was quite low, so that they became discouraged and again gave up the cultivation. Dr. Prado, however, still continues it, and, if the undertaking were supported and the prejudices of the agricultural classes could be removed, there is no doubt but that the raising of opium in Spain would become a lucrative undertaking.

Borneo Camphor. J. Kachler. (*Liebig's Annalen*, xcxcvii., 86-104.) Two samples of genuine Borneo camphor contained respectively 97.7 and 96.5 per cent. of borneol, and from 2.3 to 3.5 parts of resin and other impurities. The borneol was easily obtained in a state of purity by sublimation. The pure compound melts at 197.5-198°, solidifies at 195°, and boils at 212°.

Its specific rotatory power is $[\alpha]_D = + 32.7$. Montgolfier found $[\alpha]_D = + 37$ (*Ber.*, x., 728). The author confirms the observation of Pelouze, that ordinary camphor is formed by the action of nitric acid on borneol.

Borneol chloride, $C_{10}H_{17}Cl$, is best prepared by cautiously adding borneol to well cooled phosphorus pentachloride, every precaution being taken to avoid a great rise of temperature. The mixture is left at rest for two days, and is poured into a large volume of water,

when the chloride separates out as a waxy mass. It is purified by recrystallization from a mixture of alcohol and ether.

Borneol chloride is a colourless substance resembling camphor in appearance; it is somewhat volatile at the ordinary temperature, and has a peculiar odour. It melts at 159° , not at 147° as previously stated (*Ber.*, xi., 460), and begins to decompose when heated a few degrees above its melting point.

The chloride is insoluble in water, but dissolves in alcohol and ether. Heated at 95° in sealed tubes with water, it is completely decomposed into hydrochloric acid and a solid camphene $C_{10}H_{16}$, which melts at 51° , and is dextrogyrate. This hydrocarbon dissolves in alcohol and ether, but is insoluble in water. An addition-product is formed by passing hydrochloric acid into the ethereal solution.

Borneol chloride can also be prepared by heating borneol in sealed tubes at 100° with concentrated hydrochloric acid. The bromide is obtained in white crystals (m. p. 75°) by a similar reaction. The author confirms Montgolfier's statement that artificial borneol prepared by Baubigmy's method (*Compt. Rend.*, lxiii., 221) is identical with natural borneol in every respect excepting its action on polarised light. In the preparation of artificial borneol, it is found that the portions formed at the beginning and end of the operation are dextrogyrate, whilst the intermediate portion is lævogyrate.

Gastrolobium Bilobum. F. v. Müller and L. Rummel. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 82.) From the leaves and young twigs of this plant the authors have obtained a glucoside which they propose to name "*gastrolobin*." Its isolation was effected in the following manner:—An aqueous extract was prepared and freed from gummy matter by means of alcohol. After removing the alcohol from the filtered liquid by distillation, the residual extract was dissolved in water, and the filtered solution precipitated with neutral lead acetate in the presence of a small quantity of free acetic acid. The filtrate was then evaporated, the residue redissolved in water, this solution now precipitated with lead subacetate, and the washed precipitate suspended in water and decomposed with sulphuretted hydrogen. The filtered liquid yielded the glucoside upon evaporation to dryness.

Thus prepared, gastrolobin is a black, brittle, hygroscopic substance, having a saffron-like odour and taste. It is soluble in hot water and in alcohol, and is precipitated from its aqueous solution by subacetate but not by acetate of lead. With ammonia-water it

forms an intensely yellow solution. It is readily decomposed on boiling with dilute mineral acids, but slowly and imperfectly with organic acids. The dried herb yielded about one per cent. of this substance. The authors intend to carry out further experiments in order to show whether or not the poisonous effects of *Gastrolobium* are due to this glucoside.

Eucalyptus Globulus and Eucalyptus Rostrata. Mineral Constituents of the Wood. Watson Smith. (From a paper read before the Manchester Literary and Philosophical Society, March 9, 1880.) Determinations were made of the *specific gravity* of these woods in what may be termed the *air-dried* condition. The sections of both varieties had been placed in a dry atmosphere for one month. The results were:—

<i>Eucalyptus rostrata</i> , "Red gum."	<i>Eucalyptus globulus</i> , "Blue gum."
Specific gravity . . . 0.8112	Specific gravity . . . 0.772

These sections were planed (bark included) to thin shavings, which were now weighed, burnt in a platinum dish to white ash, and this was weighed. The results were:—

<i>E. rostrata</i> .	<i>E. globulus</i> .
Ash 2.25 p.c.	Ash 2.01 p.c.

Analyses were made of the ash obtained by burning the shavings of the larger samples. This ash was white, inclining to straw colour:—

<i>Eucalyptus rostrata</i> , "Red gum."	<i>Eucalyptus globulus</i> , "Blue gum."
K ₂ O 9.50	K ₂ O } 25.00
Na ₂ O 3.40	Na ₂ O }
MgO 6.30	MgO 6.47
CaO 43.80	CaO 35.08
Ferric and aluminic phosphates . . . 0.78	Ferric and aluminic phosphates . . . 1.07
MnO trace	MnO trace
SiO ₂ 0.29	Al ₂ O ₃ trace
SO ₃ 1.57	SiO ₂ 0.34
Cl 0.60	SO ₃ 1.55
Sand and Carbon . . 1.77	Cl 0.85
	Sand and Carbon . . 1.04

The leaves of the eucalyptus contain very considerable quantities of tannin; and the author thinks it is certain at some time or other they will prove a valuable source of tannin if the tree be largely cultivated.

The Eucalyptus and the Pine Considered in Relation to their Sanitary Properties. C. T. Kingzett. (*Chemical News*, xl., 183.) As is widely known, both the eucalyptus and the pine have long enjoyed a popular reputation as health agents. In particular the eucalyptus has acquired the character of the "fever-destroying tree," and has been largely cultivated in various parts of the world with the view of rendering habitable large districts previously devastated and depopulated by malaria, etc. In this paper, the author, referring to the old theory of the action of the eucalyptus, which attributes its sanitary powers to its drainage properties, shows that this hypothesis always lacked evidence, and at its best was of a negative character. In the first place, the eucalyptus is only superior to other trees as a means of drainage in the proportion in which its rate of growth exceeds that of other trees, and this is not sufficiently notable to account for its fever-destroying properties. Then, again, other trees, even if planted in malarial districts do not free them from the disease, so that the *action* of the eucalyptus is of a positive type, and, like the pine-tree, its properties are of a healthful nature, upon whatever soil or in whatever climate it may grow, whether in deep valleys or upon the sides of mountains. Others have maintained that just as pine forests are supposed to exert their beneficial influence upon persons suffering from pulmonary and other affections, by virtue of the volatile emanations arising from them, so the eucalyptus produces its well-known effects by the oil which is evaporated from its leaves. The author then examines this hypothesis in detail, and shows the relative oil-yielding power of the different species of eucalyptus. The genus embraces over 130 species, and of these *Eucalyptus amygdalina* is the most abundant oil-giving tree, 100 pounds of the leaves giving from 3 to 6 pounds of the oil. This oil is practically identical in composition with the oil of turpentine derived from pine trees, and with most of the so-called essential oils or perfumes. By the author's investigations it has been ascertained that all these oils when subjected to the action of atmospheric oxygen and moisture produce peroxide of hydrogen and a number of camphoraceous substances having marked antiseptic powers. Knowing, then, how much of these substances are yielded in the laboratory by a given quantity of oil of eucalyptus or oil of turpentine, the author has extended his calculations to the pine and eucalyptus forests, which are so abundantly distributed in nature. Taking New South Wales and South Australia alone, he calculates that the eucalyptus forests of this district contain at

any given moment sufficient oil in the leaves (ready to be evaporated into the atmosphere under the agency of warm winds) to form by contact with the atmosphere no less than 92,785,023 tons of pure peroxide of hydrogen, and 507,587,945, tons of camphoraceous principles. Now, if it be remembered that in nature all matters of animal and vegetable origin are oxidized by the atmosphere, which is thus kept free from the pernicious products of putrefaction, and that peroxide of hydrogen is a much more powerful oxidiser than ordinary oxygen, and if it be also borne in mind that the camphoraceous products above referred to are also powerful antiseptic agents, then the beautiful influences of the eucalyptus can neither be wondered at nor be longer open to any doubt. What is true of the eucalyptus is true also of the pine, and on an immensely larger scale, for pine forests are distributed freely over both hemispheres, and the oil of turpentine, which is a natural product of these trees, undergoes the same chemical changes in the atmosphere as oil of eucalyptus.

The Constituents of *Eupatorium Perfoliatum*. P. Collier. (*Amer. Journ. of Pharm.*, July, 1879.) The author reports the following results of the examination of "Boneset," *Eupatorium perfoliatum*, Linn. This plant has long had the reputation in domestic medicine of being a good tonic, especially valuable in the spring. Physicians have also attributed to it virtues as a diaphoretic, expectorant, emetic, and anti-intermittent. Partial analyses have been made by W. Paterson (*Amer. Journ. Pharm.*, 1851, xxiii., 206), and by M. H. Bickley (*Amer. Journ. Pharm.*, 1854, xxvi., 459).

Probably the bitter principle is the only one of medicinal importance. It is a brown, uncrystallizable substance, soluble in water and alcohol, insoluble in ether. It was impossible to purify this substance well.

Upon evaporation of an alcoholic extract of the drug a few white prismatic crystals were deposited. These crystals were difficultly soluble in hot alcohol, and insoluble in ether, water, dilute acids and dilute alkalis. They seem, therefore, to be neither acid nor alkaloid, but rather of an indifferent character.

The drug appears to contain very little volatile oil, although its odour may be accounted for by the small amount present.

Starch is not abundant. The tannic acid found gave the usual reactions, except that it failed to precipitate tartar emetic from its aqueous solution. The albuminoids were calculated from total nitrogen, multiplied by 6.25.

It is impossible to say whether sugar was present in the sub-

stance, since the bitter principle would probably give similar reactions.

The following analysis is regarded as an approximation only, but care has been taken to eliminate all preventable errors :—

Analysis of " Boneset," Eupatorium perfoliatum.

Water	9.17 per cent.
Ash	7.51 "
Albuminoids	13.30 "
Resins and Chlorophyll	15.15 "
Indifferent Crystalline Substance	2.87 "
Tannic Acid	5.04 "
Bitter Extractive	18.84 "
Gum and Colouring Matter	7.23 "
Starch Isomers.	12.47 "
Cellulose	9.32 "
Humus Substances	traces.
Volatile Oil	traces.

A False Senega. M. Siebert. (*Pharm. Zeitung*, 1880, No. 28.) The author calls attention to the character of a false senega which has recently been imported from the United States. It somewhat resembles genuine senega, but is less twisted and devoid of the characteristic keels and of annular contractions. The transverse section shows a circular or elliptical woody portion which is never incomplete, and is intersected by medullary rays like that of the genuine rhizome. Its infusion remains clear on cooling and is almost odourless; its taste is slightly aromatic and much less pungent than an infusion of senega.

Statice Caroliniana. E. L. Reed. From an Inaugural Essay. (*Amer. Journ. of Pharm.*, Sept., 1879, 442.) Marsh rosemary is considered by Nuttall, Torrey, and other botanists, as a mere variety of *Statice limonium* of Europe; while others regard it as a distinct species. It is indigenous to the Atlantic coast of the United States, and has a perennial root, sending up annually tufts of leaves, which are obovate, or cuneiform, entire, mucronate, smooth, and on long footstalks. They differ from the leaves of *S. limonium* in being flat on the margin, while the latter are undulated. The flower stem is round and smooth, from a few inches to a foot or more in length, sending off near its summit numerous subdividing branches, which terminate in spikes, and form altogether a loose panicle. The flowers are small, bluish purple, erect upon one side only of the common peduncle, with a mucronate, scaly bract at the base of each, a five-angled, five-toothed calyx, and

spatulate obtuse petals. The meadows in the vicinity of Atlantic City are made beautiful by the marsh rosemary when in flower. The delicate bluish purple of its blossoms, which appear in August and September, produce a pleasant relief to the eye from the varying shades of green of the salt grasses. It is the forerunner of the bright yellow and crimson tints of the pickle-weed, which later in the fall gives to the meadows such richness of colour. The marsh rosemary, or meadow lavender, is highly prized by those who collect grasses to ornament their homes in winter, and is placed above picture frames and in bouquets as one of their most attractive features. The root collected in October possesses medicinal properties in a higher degree than that collected later in the season. It is large and spindle shaped, branched, fleshy, compact, rough and of a purplish brown colour. Its length depends upon the nature of the soil, which varies from dark muddy to light sandy in numerous localities over the meadows. If found in sandy soil, the root is short and of a branching character; while that obtained from muddy soil is long, straight, and less branching. It is bitter and very astringent to the taste, and in the fresh state is without odour, but a decoction kept in a warm place for several days ferments, and has a molasses-like odour.

The fresh root is tough and not easily bruised except after the addition of a little alcohol. The tincture obtained with a mixture of one part of alcohol and two parts of water yielded a precipitate with acetate of lead, the filtrate from which contained sugar, gum, and extractive matter. The precipitate was dissolved in alcohol, the solution decomposed by sulphuretted hydrogen, and the filtrate evaporated; it yielded $17\frac{1}{8}$ per cent. of residue, consisting chiefly of tannin, which gives a greenish black colour with solution of chloride of iron. Statice is powerfully astringent. In domestic practice it is frequently used in some parts of the coast-line as a remedy for diarrhoea and dysentery, to restrain morbid discharges from mucous surfaces, as a gargle in sore throat and aphthous condition of the mouth and fauces, and as a styptic in passive hemorrhages. In the form of a tincture or decoction, it may be employed for the same purpose as kino or catechu. Its abundance and valuable properties should cause it to be more generally used.

Helianthus Annuus. Dr. P. Filstow. (*Pharm. Zeitschr. für Russland*, 1879, 119.) The author recommends the stem of the sunflower, *Helianthus annuus*, as a valuable remedy for intermittent fever. He claims to have obtained results with it fully equal to

those produced by quinine. It is administered in the form of either an infusion or a tincture.

Notes on some Japanese Drugs. E. M. Holmes. (*Pharm. Journ.*, 3rd series, x., 3-5, 21-23, 101-103, 201-203, and 261, 262.) The drugs noticed and described in this paper comprise the following, all of which were met with in the London market. The Japanese names, *kung*, *soh*, *yoh*, *kah*, *she*, *ning*, mean respectively, root, herb, leaves, flowers, seeds, and kernels, and must therefore not be looked upon as part of the name of the plant which yields them.

Roots.

BAI-MO : *Fritillaria Thunbergii*, Miq. Prol. p. 321; Fr. et Sav. vol. ii. pt. 1, p. 61; Sô makou Zoussetz, vol. v. fig. 70; *Uvularia cirrhosa*, Thunb. Fl. Jap. p. 136.

Syn. FARU JURI, AMISA JURI, Fr. et Sav.

BIAKOO-BOO KUNG : *Roxburghia sessilifolia*, Miq. Prol. p. 143; *Stemone sessilifolia*, Fr. et Sav. vol. ii. pt. 1, p. 92.

Syn. HIYAKUBU, Sô mokou Zoussetz, vol. ii. fig. 55; SHIA-KOUBOU, Phonzou Zoufou, vol. xxviii. p. 6.

BIAK-YITZ : *Atractylis ovata*, Thunb. Fl. Jap. p. 306.

Syn. BIYAKU JUTSU, Sô mokou Zoussetz, vol. xv. fig. 49; BIAKOU SITSOU, Phonzou Zoufou, vol. iv. pp. 25, 26; IKERA, Fr. et Sav., vol. i. p. 256.

BOO KUNG : *Eulalia Japonica*, Trin.; TO KIWA, ITO KAJA, KAJA, Miq. Prol. p. 177; OBANNA, SUSSUKI, Thunb. Fl. Jap. p. 42; FUKU, TSIKUSITS, TSIKUBE, SASADSITZ, Sasa.

Syn. MEGURI, Kœmpf. Amœn. p. 899, Fr. et Sav. vol. ii. p. 182.

BIAK-MONG-DAU : (*Ophiopogon Japonicus*, Ker.).

Syn. JANO-HIGE, Sô mokou Zoussetz, vol. vi. fig. 45, under *Fluggea Japonica*, Kunth., JAMMA SOB, JAWRANG; Thunb. Fl. Jap. p. 139; under *Convallaria Japonica*, L.; MONDO, BIAKFMONDO, RIUNO FIGE, Kœmpf. Amœn. Exot. p. 823 and fig. p. 824; MIH-MUN-TUNG, Hanbury "Science Papers," p. 256, with fig. of tubercules; DJIA-NO-SHIGE, Fr. et Sav. vol. ii. pt. 1, p. 85.

TSIKU-SETZ NIN-JIN : *Aralia edulis*, Sieb. (?)

Syn. UDO, DO-TOOKI, Sieb. et Zucc. p. 57; DOKU QUATZ, DOSJEN, Kœmpf. Amœn. p. 826; *Aralia cordata*, Thunb. (p. 127) F. et Sav. vol. i. p. 191.

DEE-OH : *Rehmannia lutea*, Max.

Syn. TI-HWANG, Porter Smith, p. 148; SAS-HIME, Sô mokou; Zoussetz, vol. xi. p. 52; DZIWO, Fr. et Sav. vol. i. p. 328; SAÔ HIME, GOMA TOME SAÔ, Phonzou Zoufou, vol. xvii. fol. 23.

GAH-DITZ: *Curcuma Zerumbet*, Roxb.

HAK-TAU-AU: *Anemone cernua*, Th.

Syn. NEKO BANA, Fr. et Sav. vol. i. p. 4; HOKINA G'ZA, Phonzou Zoufou, vol. vi. fol. 23; OKINA GUSA, SHAGUMA SAIKO, Sô mokou Zoussetz, vol. x. fig. 34; OLLINA GUSA, Thunb. Fl. Jap. p. 238; KAWARA SAIKO, Sieb. et Zucc. Fl. Jap. p. 14.

HAN-GE: *Pinellia tuberifera*, Ten.

Syn. KARASUBISHAKU, Sô mokou Zoussetz, vol. xix. fig. 1; Phonzou Zoufou, vol. xvii. p. 23; SANGPWAN-HEA, Hanbury "Science Papers," p. 262, with fig. of root; MIDSUMMER ROOT, PWANHIA, Porter Smith, "Chinese Materia Medica," p. 149; TOO HANGE, Fr. et Sav. vol. ii. pl. 1, p. 3; FANKE SO, KRAS NO FISIAKU, Thunb. Fl. Jap. p. 233.

KAI: *Dioscorea quinqueloba*, Thunb.

Syn. KIKUBA-DOKORO, Sô mokou Zoussetz, vol. xx. fig. 54; KAI, TOKORO, Kœmpf. Amœn. p. 827.

KASSUDA FANNA DAKKA, KARASUNO SENI, Thunb. Fl. Jap. p. 150.

KAS-HI-YU.

KESSO: *Patrinia scabiosæfolia*, Link. (Valerianacæ.)

Syn. OMINA-MESHI, Sô mokou Zoussetz, vol. ii. p. 21; WOMINA MESI, JAMA NJAN KUSOO, URO AMISI, ORO AMI, Fr. et Sav. vol. i. p. 216.

KI-KYÔ: *Platycodon grandiflorum*, A.DC. (Campanulacæ), Sô mokou Zoussetz, vol. iii. fig. 3; Phonzou Zoufou, vol. iv. pp. 14, 15.

Syn. *Campanula glauca*, Thunb. Fl. Jap. p. 88; KEKKO, KIRJO, KIRAKOO, Kœmpf. Amœn. p. 822.

KIN-KEE: *Malva sylvestris*, L., Fr., and Sav. vol. i. p. 62.

Syn. ZENI-AOI, Sô mokou Zoussetz, vol. xii. fig. 54.

This root resembles in every respect that obtainable in England, except that it is whiter and evidently carefully washed and rubbed before drying.

It is probably cultivated in Japan, and not really wild, according to Franchet and Savatier.

KUH-SHING.

OH-REN: *Coptis anemoneæfolia*, Sieb. et Zucc. (Ranunculacæ); Sô mokou Zouss., vol. x. fig. 36.

Syn. KAKOUMA G'ZA, Fr. et Sav. vol. i. p. 10; Phonzou, vol. vii. p. 2.

BOTAN: *Pæonia Moutan*, Dec.

Syn. MAU-TAN, Porter Smith, Chinese Mat. Med. p. 169, Phonzou Zoufou, vol. ix. p. 14.

REW-TANG SOH: *Gentiana Buergen*, Miq.

- Syn.* RINDO, Sô mokou Zoussetz, vol. iv. fig. 47; SASA RINDO, Fr. et Sav. vol. i. p. 323; Phonzou Zoufou, vol. viii. p. 5.
- SANG-YAK: *Dioscorea japonica*, Th., Fl. Jap. p. 151.
- Syn.* YAMA-NO-IMO, JIJENJO; Sô mokou Zoussetz, vol. xx. fig. 56; DSOJO, IAMMA IMO, Kœmpf. Amœn. p. 828.
- SEKI-SHO KUNG: *Acorus gramineus*, Ait. Sô mokou Zoussetz, vol. vii. fig. 10; Phonzou Zoufou, vol. xxxiii. p. 17; Fr. et Sav. vol. ii. pt. 1, p. 10.
- SENG-KIU: Sô mokou Zoussetz, vol. v. fig. 1; *Conioselinum univittatum*, Turcz, Fr. et Sav. vol. ii. p. 375.
- SENG-KOOTZ: *Nuphar japonicum*, D. C. (Nymphæacæ).
- Syn.* *Nymphae lutea*, L.; Thunb. Fl. Jap. p. 223. KAWAHONE, Sô mokou Zoussetz, vol. x. fig. 10; FEISO, KAWAHONE, Kœmpf. Amœn. p. 880.
- SEE-YOH-BEI: *Geum japonicum*, Th. (Rosacæ).
- Syn.* DAIKONSO, Sô mokou Zoussetz, vol. ix. fig. 41; Thunb. Fl. Jap. p. 220; Fr. et Sav. vol. i. p. 128.
- SHAU-BOOKUNG: *Acorus spurius*, Schott, Ann. Mus. Lugd. Batav. 1 p. 284; Aracæ.
- Syn.* SHOBU, Sô mokou Zoussetz, vol. vii. fig. 9; Phonzou Zoufou, vol. xxxiii. p. 17; KAWA SOB, KAWA SOBU, Kœmpf. Amœn. p. 912.
- TENG-MA: *Urtica tuberosa*, Roxb. (?); Porter Smith, Chinese Mat. Med. p. 225, *Pouzolzia tuberosa*, Wight, Icon. Pl. Ind., vol. ii. t. 697.
- TAK-SHA: *Alisma Plantago*, L. (Alismacæ).
- Syn.* SAJI-OMODAKA, Sô mokou Zoussetz, vol. vii. fig. 33; TOKUSA, SASI-OMODAKA, Thunb. Fl. Jap. p. 153.
- TENG-MONG-DAU: *Asparagus lucidus*, Lindl. (Liliacæ).
- Syn.* KUSASUGIKADZURA, Sô mokou Zoussetz, vol. vii. fig. 6; Phonzou Zoufou, vol. xxviii. p. 3; TEEN-MUN-TUNG, Hanbury "Science Papers," p. 257; KE MUNDO, TEN MONDO, Thunberg, Fl. Jap. p. 257; T'ÏEN-MEN-TUNG, Dr. Porter Smith, Chinese Mat. Med. p. 145, Tomo-roki, Ten mada, Fr. et Sav. vol. ii. p. 1, p. 59.
- TAU-HOONG-SO: *Veratrum album* (?).
- Syn.* BAI-KAI-SO, Fr. et Sav. vol. ii. pl. 1. p. 91.
- TO-KEE: *Ligusticum acutilobum*, Sieb. et Zucc.
- Syn.* TOKI, Sô mokou Zoussetz, vol. v. fig. 4; Fr. et Sav. vol. i. p. 186.
- TO-SAI-SHIN: *Asarum Sieboldii*, Miq. fol. coriaceis (Aristolochiacæ), Sô mokou Zoussetz, vol. ix. fig. 5; Phonzou Zoufou, vol. viii. p. 8.

Herbs and Leaves.

HAKKA: *Mentha austriaca*, Jacq. (?) Fr. et. Sav. vol. i. p. 366.

Syn. Mentha arvensis, L., var. *Javanica*, Bl.; Pharmacographia, p. 434, note 1; *Mentha arvensis*, var. *vulgaris*, Benth. MEGUSA Sô mokou Zoussetz, vol. xi. fig. 27; Phonzou Zoufou, vol. xii. fol. 10.

KEI-NING-SOH: *Digenea simplex*, Ag. (Algæ).

KING-KI-YO: *Malva sylvestris*, Linn.

Syn. ZENI-AOI, Sô mokou Zoussetz, vol. xii. fig. 54.

SHISSO: *Perilla arguta*, Benth.; Fr. et. Sav., vol. i. p. 365; Sô mokou Zoussetz, vol. xi. fig. 24; Phonzou Zoufou, vol. xii. p. 113 (calyx bad).

Syn. SISSOO, JAKOSJU, Miq. Prol., p. 36.

TO-YAK: *Pleurogyne rotata*, Griseb. (Gentianaceæ); *Sivertia rotata*, Thunb. Fl. Jap., p. 115.

Syn. SENBURI, TOYAKU; Sô mokou Zoussetz, vol. iv. f. 54.

Flowers.

BIAK-TAU KAH: *Amygdalus persica*?

Syn. TOO, Thunb. Flor. Jap., p. 119; T'AU, Porter Smith, Chinese Mat. Med., p. 168.

CHAU-TO-KO: *Uncaria Gambir*, Roxb. (Cinchonaceæ).

Syn. TIAN-T'ANG, Porter Smith, Chinese Mat. Med. p. 224.

HOH-OH: *Typha japonica*, Miq.

Syn. P'U HWANG, Porter Smith, Chinese Mat. Med., p. 224.

IN T'YING: *Artemisia capillaris*, Thunb.

Syn. INTSJIN; FKI IAMOGI and KAWARA IAMOGI; Kœmpf. Amcæn., p. 897; IAMMA INTSJIN; Thunb. Fl. Jap., p. 309; KAWARA YOMOGI, Sô mokou Zoussetz, vol. xvi. fig. 27; Phonzou Zoufou, vol. xiv. fol. 2.

SET-KOTZ-MO KAH: *Sambucus nigra*, L.

Syn. NIWA TOKA, Tonga, Kœmpf. Amcæn. fasc. v. p. 787; Thunb. Fl. Jap., p. 126.

SHIN-EE: *Magnolia Yulan*, Desf.

Syn. SIN-í; Porter Smith, Chinese Mat. Med., p. 142.

Fruits and Seeds.

GOBO SEE: *Arctium Lappa*, L. (Compositæ).

Syn. Lappa Major, Gaertn, Fr. et Sav., vol. i. p. 262; GOBO, UMMA BUSUKI; Kœmpf. Amcæn., p. 828; Thunb. Fl. Jap., p. 304; KOUMA TORI BOKOUDI, Phonzou Zoufou, vol. xv. fol. 23; GOBO, Sô mokou Zoussetz, vol. xv. fig. 33.

GOME SEE : *Schizandra nigra*, Max.

Syn. MADZI-SSA, Maximowicz, *Diag. Pl. Nov. Jap. et Mandsh.*
Dec. x. p. 370.

GO-SIU-JU : *Evodia rutecarpa*, Benth.

Syn. *Boymia rutecarpa*, Sieb. et Zucc., vol. i. p. 50; Go-SJU-JU;
KAWA HASIKAMI, HABITE KOBURA, Fr. et Sav., vol. i. pp. 71, 72;
Phonzou Zoufou, vol. lxx. fol. 11.

KEE-KOCK : *Citrus fusca*, Lour.

Syn. CHÍ-KOH, Porter Smith, *Chin. Mat. Med.*, p. 66; CAY BAONG,
CHI XAC, CHI KEN, Lour. *Fl. Cochinchinensis*, p. 467.

KETZ-MAY SEE; *Cassia Tora*, L. (Leguminosæ). *Pharm. Journ.*,
3rd series, vol. vii., p. 350.

Syn. KIUEH-MING-TSZE, Porter Smith, *Chinese Mat. Med.*, p. 54;
KEUE-MING TSZE, Hanbury "Science Papers," p. 231; TAGARAT-
ELLEY, Ainslie *Mat. Med.* vol. ii. p. 405; KETSUMEI, Miq. *Prol.*
p. 243; YEBISUGUSA, Sô mokou Zoussetz, vol. viii. fig. 1;
Phonzou Zoufou, vol. xviii. fol. 12.

KIEU-ESS : *Allium senescens*, Thunb. *Fl. Jap.* p. 132.

Syn. YAMA-RAKKYO, Phonzou Zoufou, vol. xlv. fol. 13; Sô mokou
Zoussetz, vol. vi. fig. 37; *Allium japonicum*, Regel., Fr. et Sav.
vol. ii. pt. 1, p. 77.

KOTREE SEE : *Coriandrum sativum*, L.

MAHNG DAH-RAH-GAY : *Datura alba*, Nees.; Nees. in *Linn. Tran.* 17
p. 73; *D. Stramonium*, Thunb., *Fl. Jap.* p. 91.

Syn. MAN-TO-LO-HWA, Dr. Porter Smith, *Mat. Med. Chin.*, p. 83;
CHOSENASA-GAO, Sô mokou Zoussetz, vol. iii. fol. 55; MANDARA-
REUGE, Phonzou Zoufou, vol. xxiii. fol. 20.

MEH-NO-ME : *Prunus Armeniaca*, L. (Apricot kernels).

Syn. KJOO, KARA MOMU, ANSU, Kœmpf. *Amœn.* p. 798, Thunb.
Fl. Jap. p. 200.

OO-BEI : *Amygdalus nana*, L.

Syn. *Prunus Mume*, Sieb. et Zucc., *Fl. Jap.* I. p. 29; BAI, Thun-
berg, *Fl. Jap.*, p. 199; UME AND UMEBOS, Kœmpf. *Amœn.* p.
799; MUME, MOMI, Fr. et Sav., vol. i. p. 117.

REN-NIKH : *Nelumbium speciosum*, Willd.

Syn. *Nymphaea Nelumbo*, L.; Thunb. *Fl. Jap.*, p. 223; LIEN-GAU,
Porter Smith, *Chinese Mat. Med.*, p. 139, *sub* Lotus; REN,
HATSIS; Kœmpf. *Amœn.*, p. 880; HASU, Hachisu, Sô mokou
Zoussetz, vol. x. fol. 9; Phonzou Zoufou, vol. xxxiv. fol. 9.

SAI HEE : *Citrus bigaradia*, var. *trifolia*, Thunb. *Fl. Jap.* p. 294.

Syn. SSI *vulgo* KARATATS BANNA GEES, Kœmpf. *Amœn.*, p. 801
with fig.; Kô KITS, Phonzou Zoufou, vol. lxxxvii. fol. 8.

SANG-SHIH SEE: *Gardenia florida*, L.

Syn. SHAN-CHI-TSZE, Porter Smith, Chinese Mat. Med., p. 101; SAN CHE, Hanbury "Science Papers," p. 241, fig. 7; KUTSI JINASI, Fr. et Sav., vol. i. p. 207; SANSISI, MISUKTJINASI, Thunb. Fl. Jap. p. 109; KUTSJINAS, Kœmpf. Amœn., p. 808.

SEKKEE-DOO HEE: *Punica Granatum*, L.

Syn. SHIULI-P'I, Porter Smith, Chinese Mat. Med., p. 176; DSJAKURGO or SAKURO, Kœmpf. Amœn., p. 800; Thunb. Fl. Jap. p. 199.

SHO-EE-KOH: *Fœniculum vulgare*.

Syn. SEN-RIO; KURE NO NOMO, Thunb. Fl. Jap. p. 120.

SHIKU-SHA: *Alpinia japonica*, Miq. Prol. p. 304.

Syn. *Globba japonica*, Thunb. Fl. Jap. p. 23; HANA-MIYO-GA, Sô mokou Zoussetz, vol. i. fig. 10; SAN DSJOKA, JAMMA MJOGO, Kœmpf. Amœn. p. 827; Phonzou Zoufou, vol. 10, fig. 5, Fr. et Sav. vol. ii. pt. 1, p. 20.

TAU NING: *Amygdalus Persica*.

Syn. TOO, MOMU, Kœmpf. Amœn. p. 798; Thunb. Fl. Jap. p. 199; TAU-JIN, P. Smith, Chinese Mat. Med., p. 169.

Quebracho Bark. O. Primke. (*Pharm. Zeitung*, 1880, 64.)

According to information received by the author from Dr. Hieronymus, of the University of Cordoba, in the Argentine Republic, the wood and bark of the following trees all occur in commerce under the name of quebracho.

1. *Aspidosperma Quebracho*, commonly known as "white quebracho." The bark of this tree is collected in the province of Santiago and the vicinity of Catamarca, and is used by the natives as a remedy for malarial fevers and asthma. A description of this bark will be found in the *Year-Book of Pharmacy*, 1879, p. 193.

2. *Loxopterigium Lorentzii*, or *Quebracho colorado*, (see *Year-Book of Pharmacy*, 1879, p. 178). The wood and bark of this tree are used for tanning purposes.

3. *Iodina Rhombifolia*, distinguished as *Quebracho flogo*. Nat. Ord., *Aquifoliaceæ*. The wood and bark of this tree are often mixed with those of the white quebracho.

4. *Machærium fertile*, *syn. Tipoana speciosa*, commonly called *Tipa*. The wood and bark of this leguminous tree are used for tanning, but are inferior for this purpose to *Quebracho colorado*.

Spurious Quebracho Bark. Dr. J. Biel. (*Pharm. Zeitung*, 1880, 118.) The author gives the following description of a false quebracho bark of which large quantities have been met with in the German markets. It consists of pieces of different length, $\frac{1}{2}$ to

2 inches wide, and 1 to $2\frac{1}{2}$ lines thick, usually rolled, and covered externally with a yellowish white periderm, showing numerous deep longitudinal furrows and slight transverse cracks; internally the bark is dark brown. The fracture appears granular in the outer and fibrous in the inner bark. The taste is bitter but not aromatic.

The outer bark consists of numerous regular layers of tabular leathery cork cells, covering an equally thick spongy cork layer, composed of tangentially stretched and thin-walled cells. A light continuous circle of stone cells and strongly thickened walls forms the inner limit of this layer, and can be seen with the naked eye. The middle bark consists of parenchyma cells, filled partially with a dark-brown substance, and besides contains scattered groups of 10 to 20 stone cells, and scattered bast-cell bundles, which are more numerous towards the inner layer, and finally form the inner bark, consisting almost entirely of these bast-cells, and of narrow medullary rays, containing a dark substance.

The Alkaloid of *Aspidosperma Quebracho*. G. Fraude. (*Ber. der deutsch. chem. Ges.*, xii., 1560.) The author supplies some further information respecting the alkaloid *aspidospermine* obtained from white quebracho bark. Its composition is represented by the formula $C_{22}H_{30}N_2O_2$. It is soluble in 6000 parts of water, in 48 parts of strong alcohol, and in 106 parts of anhydrous ether. Its aqueous solution has a markedly bitter taste. With solution of perchloric acid it produces an intense red coloration, and with sulphuric acid and lead peroxide it yields a brown colour gradually changing to cherry-red. When treated with sulphuric acid and potassium bichromate, it produces a brown coloration which slowly changes to olive-green. Hydrochloric acid solutions of this base reduce Fehling's solution when boiled with it.

The author also describes several salts of this alkaloid, viz., the sulphate, hydrochlorate, chromate, and perchlorate.

Melia Azedarach. J. Jacobs. (From an inaugural essay. *Amer. Journ. Pharm.*, Sept., 1879, 443.) This beautiful tree is highly appreciated in the Southern United States for the beauty of its flowers, the elegance of its foliage, and the medicinal uses to which it is applied; as a shade tree its popularity is equal to that of the maple in the north. It appears to be indigenous to Asia, but is planted as an ornamental tree in Southern Europe, whence it was introduced into and naturalized in the United States at an early period after the settlement of Carolina and Georgia. It is not found farther north than Virginia, as the severity of the climate of the more northern districts destroys it. The common names, *pride*

of *China* and *pride of India*, undoubtedly originated from its rare beauty; *Indian lilac*, from the resemblance of its flowers to those of the common syringa; and *bead tree*, from the use of the nuts in rosaries, to which, also, the German name Paternosterbaum (*pater-noster tree*) alludes. In the Southern States it is known as *China-berry*, and to the young as *pop-gun tree*, in allusion to the use of its green fruit.

The tree attains a height of 30 to 40 feet, and from 15 to 20 inches in diameter; it grows rapidly, reaching the height of 12 or 15 feet in four years. The green fruit is very astringent, but when ripe it is a fleshy-yellow drupe, of a sweet taste, rather larger than a cherry, and containing a five-celled bony nut. The green fruit is used in Texas for making blacking.

The ripe berries were largely used in Georgia during the late war for the purpose of obtaining alcohol, by the usual process of fermentation and distillation; the whisky thus obtained was preferred by many to that produced from corn or rye. The fleshy part of the fruit yields, on expression, a fixed oil suitable for soap-making.

Remarkable qualities are said to reside in the fruit, such as will intoxicate robins, which are particularly fond of and feed upon them during their annual migration southward; the seeds are widely dispersed by these birds, and hence trees are found in secluded places. Instances are known of the fruit being destructive to hogs, by what means it is not yet ascertained. A decoction of the berries sprinkled on plants prevents the depredations of the grub-worm. The leaves and berries will preserve dried fruit from insects, and when packed with clothing will prevent the attack of moths.

The dried berries in whisky have been employed against ascarides, tapeworm, and verminous maladies. The pulp of the berries stewed in lard has been used with success as an ointment in scald head. The decoction of the leaves has been employed in hysteria, and is astringent and stomachic. A decoction of the green bark, four ounces to the pint, is administered as an athelmintic in doses of one or two fluid ounces, followed by a cathartic. When prepared in March or April, while the sap is ascending, unpleasant effects have been observed, such as stupor, dilation of the pupil, etc., which symptoms, however, pass off without perceptible injury to the system.

The inner bark or liber is extremely bitter, devoid of astringency, and does not give any indication of the presence of tannin. The outer bark, on the other hand, is very astringent, and its decoction

gives abundant precipitates with gelatin and ferric chloride. The author's examination of the bark leads to the following conclusions:—

1. The activity of the bark resides in the liber, and this alone should be employed.

2. The active principle is a yellowish white resin.

3. The drug is one of the best anthelmintics, and a fluid extract, prepared with diluted alcohol, or a tincture, would be a valuable preparation that would seem to deserve a place in the Pharmacopœia.

Preliminary Examination of *Teucrium Fruticans*. A. Ogliastro. (*Gaz. Chim. Ital.*, viii., 440–446. From *Journ. Chem. Soc.*) This labiate plant, which is employed as a febrifuge, is called “olivetta” by the Italian peasants, from the resemblance of its leaves in colour to those of the wild olive. The fresh plant, collected in June soon after flowering, gave no essential oil when distilled with water; it was therefore dried in the sunshine, and treated with boiling alcohol in a continuous displacement apparatus for two days. On cooling, the extract deposited a deep green granular pasty substance. The partly exhausted plant was then treated for other two days with fresh spirit, and on cooling a nearly colourless crystalline substance was deposited from the solution.

The green deposit from the first extract consists of two substances mixed with a large quantity of chlorophyll. When treated with boiling alcohol, a white crystalline substance is left undissolved, identical with the crystalline deposit from the second extract. The other compound, which is readily soluble in hot alcohol and in benzene, can only be freed from chlorophyll with difficulty. It is a nearly white somewhat soft substance, insoluble in water, and melting at about 80–85°. As it does not crystallize, and constant analytical results could not be obtained, the author is inclined to consider it as a mixture.

Teucrin.—The nearly colourless crystalline substance obtained from *Teucrium fruticans* dissolves but very sparingly in any of the ordinary solvents, with the exception of glacial acetic acid, which affords the best means of purifying it. It crystallizes in slender prisms of a yellowish colour, which melt at 228–230° with decomposition. The results of the analyses accord best with the formula $C_{21}H_{24}O_{11}$, but the author reserves his opinion on this subject until he has more thoroughly investigated the nature of the substance. Teucrin is decomposed when heated with dilute nitric acid, leaving a residue of a red colour; on cooling the solution deposits yellow

crystals, which may be purified by recrystallization from boiling water. The new substance is thus obtained in long silky prisms (m. p. 180°) of a golden colour. It is of an acid nature, and yields a silver salt, rather soluble in water, but which is thrown down in splendid golden-yellow plates on adding alcohol or ether to a mixture of the ammonium salt with silver nitrate. The analysis of the acid itself and that of the silver salt points to the formula $C_8H_8O_3$ for the acid, which is that of hydroxytoluic acid; its fusion point also, is nearly the same as that of Fittica's β . hydroxytoluic acid (*Ber.* vii. 927). The nitric acid mother-liquors, from which this acid crystallizes, contain oxalic and tartaric acids, indicating that the substance is a glucoside. Teucrin is decomposed when boiled with dilute sulphuric acid, leaving a yellow residue of an acid nature, the quantity of which was too small to establish its identity with the acid obtained by the action of the nitric acid; the solution contains a substance of the nature of glucose, so that there can be no doubt that teucrin is a glucoside. Three 0.5 gram doses of teucrin administered to a dog caused a lowering of the temperature of the animal.

Pæonia Peregrina. Prof. Dragendorff and M. Stahre. (*Archiv der Pharm.* [3], xiv., 412 and 531.) The authors have examined the seeds of this plant and found them to have the following composition:—

Moisture	8.45 per cent.
Ash (containing a large proportion of Phosphoric Acid)	2.57 „
Oil (soluble in Petroleum Spirit) .	23.61 „
Resin	1.13 „
Tannin	under 1 „
Pæony Fluorescein	about 4 „
Pæony Brown	about 4 „
Legumin, with Albumen and Muci- lage	5.44 „
Other Albuminoids and an Alka- loid	5.5 „
Sugar	1.4 „
Substances soluble in strong alcohol but insoluble in dilute alcohol and in water	7.68 „
Gummic Acid	1.22 „
Cellulose	11.73 „
Other constituents of the cell-walls .	22.56 „

The alkaloid found in these seeds and also in the root differs from those contained in aconite and delphinium.

Veratrum Viride. C. Bullock. (*Amer. Journ. of Pharm.*, July, 1879. From *Journ. Chem. Soc.*) The powdered rhizome and rootlets of this plant were exhausted with alcohol, and after evaporation, the residue was freed from alcohol by a continued moderate heat; the resin which separated from the soft extract was removed and allowed to drain for several weeks during warm weather.

The Soft Extract.—86 per cent. was soluble in water; 43 per cent. of fatty matter was removed by light petroleum. The aqueous extract was concentrated and made alkaline with sodium carbonate; after filtering off the precipitated alkaloids, the solution was heated to 66° C. and a little soda added; the additional precipitate was then filtered off while the liquid was warm: the precipitated alkaloids from one pound of root amounted to 19.3 grains, about one-ninth of which was precipitated by warming after addition of soda. Colouring matter was removed by dissolving in acetic acid and reprecipitating from the warm solution; and the united mother-liquors, after being acidified and evaporated, were made alkaline, treated with ether, the ether product dissolved in acetic acid, filtered, and precipitated as before. The total weight of mixed alkaloids obtained was 12.4 grains, of which 1.7 grain had been separated from the mother-liquors.

The *jervine* was precipitated as nitrate from an acetic acid solution containing 3 grains in each fluid ounce, by addition of an equal volume of saturated potassium nitrate solution. The precipitate was filtered off after six hours, washed with potassium nitrate solution, pressed between bibulous paper, and dried: its weight was 7.9 grains, and the weight of alkaloids precipitated from the concentrated filtrate by warming with soda was 3.2 grains.

The aqueous solution, after removal of the alkaloids, was treated with subacetate of lead, the excess of lead separated, and the free acid neutralised with barium carbonate; the filtered solution was then evaporated to a syrup, and thrown into alcohol. The filtered alcohol solution, evaporated and dried at 100°, yielded a product with sweet and somewhat bitter taste, energetically reducing copper and silver salts, and apparently consisting almost entirely of glucose; its weight amounted to 8.5 per cent. of the total aqueous extract.

The alkaloids were then removed from the resin, both that from the soft extract and also the hard resin. Fatty matter was first dissolved away by light petroleum, then the powdered resin was made into a smooth paste with water, and dissolved in a solution of sodium carbonate containing soda. The alkaline solution was

twice agitated with ether, and the ether extract dissolved in acetic acid, filtered, and the alkaloids precipitated as above; the alkaloids were also extracted from the mother-liquor, and the jervine separated from the alkaloids as nitrate. A further minute quantity of alkaloids was obtained from the alkaline solution of the resin.

The total amount of alkaloids obtained from the extract representing one pound of root was 46.6 grains, and from this, 31.2 grains of nitrate of jervine and 11 grains of the other alkaloids were obtained, the loss of 10 per cent. representing loss and removal of foreign matter. About one-quarter of the total weight of jervine was obtained from the soft extract and from the resin from the soft extract, the hard resin yielding about one-half of the total weight. Wright obtained only 0.80 gram of alkaloids per kilogram of the root employed, while the author obtained 6.612 grams, the excess being due probably to the alkaloid separated by him from the resin.

The alkaloids, after separation of the jervine and crystallization from alcohol, showed under the microscope crystalline forms differing from jervine, the substance probably being Wright's pseudo-jervine; when purified, it amounted to 5 per cent. of the mixed alkaloids.

Saponification of the Hard Resin by Lime.—From one pound of the hard resin the fatty matter was removed by light petroleum; it was then rubbed into a smooth paste with two pounds of slaked lime, water added, and the mixture boiled for a few minutes. After evaporation and drying on the steam-bath, the powdered mass was exhausted with three gallons of hot alcohol. The alkaloids obtained from the alcoholic extract, when purified by reprecipitation, amounted to more than 485 grains, a quantity 20 per cent. greater than that yielded by the ether process, and corresponding to 4.21 grams per kilogram of the root.

Chestnut Leaves. L. J. Steltzer. (*Amer. Journ. of Pharm.*, June, 1880.) Chestnut leaves should be gathered for medicinal use in the months of September and October, while still green; they possess a faint characteristic odour. When gathered in the early part of October they lose in drying 49 per cent. of their weight, retaining most of their green colour, except the mid-rib, which changes to brown. They do not become brittle, and are, therefore, with difficulty reduced to powder.

The leaves contain a considerable amount of tannin and extractive matter. The powder cannot be percolated alone on account of swelling when water or alcohol is added. A fluid extract is made

by repeatedly digesting the leaves in water and expressing the juice, adding glycerine and sugar, and evaporating, as recommended by Prof. J. M. Maisch (*Amer. Journ. of Pharm.*, December, 1871). A tincture made in the proportion of two ounces of the leaves to a pint of diluted alcohol is also frequently used.

Chestnut leaves were first brought to the notice of the medical profession by Mr. George C. Close, in the year 1862, but were used by some physicians and in domestic practice previous to that time. They have been used with good success as a remedy for whooping cough; appear to control the spasms, and often cause their suspension in a few days. The fluid extract is probably the best preparation to use, as it contains the drug in a concentrated form, and is not unpleasant to take. The tincture may also be used, but the objection to it is the large dose required, and the amount of alcohol contained therein.

The author's chemical examination of the leaves shows the presence of tannin (9 per cent.), gum, albumen, a trace of resin, fat, extractive matter, lignin, and 5.4 per cent. of mineral matter, consisting of the carbonates, chlorides, and phosphates of potassium, calcium, magnesium, and iron.

Anemopsis Californica. J. U. Lloyd. (*Amer. Journ. of Pharm.*, January, 1880.) This plant belongs to the Order *Saururaceæ*. A brief notice of the properties and uses of its root appeared in the *American Journal of Pharmacy*, December, 1879. (See *Year-Book of Pharmacy*, 1879, p. 190.)

All parts of the plant exhale, when broken, a pungent, disagreeable, penetrating odour. The taste is aromatic and peppery. Alcohol readily extracts all the sensible characteristics. Water simply becomes flavoured when boiled with the root, the filtrate being astringent and highly charged with glucose. It does not afford precipitates with the usual reagents for alkaloids. The odour and taste of the plant is derived from a volatile oil; this is obtained in the proportion of 6 fluid drachms to the avoirdupois pound by distilling the dried root with water.

Essential Oil, A.—This is heavier than water, yellowish, very refractive, and to the taste sharp, pungent, and possessing, in a high degree, the characteristic odour and flavour of the plant. It dissolves in all proportions in alcohol, ether, chloroform, and carbon disulphide.

When mixed with an equal bulk of sulphuric acid heat is evolved, and a thick, dark red liquid results. This dissolves in alcohol and chloroform, with production of a beautiful red colour; is insoluble

in ether, but becomes thinner when mixed with it and permitted to separate. This substance does not retain the odour of the oil.

When the essential oil is poured upon the surface of freshly prepared nitromuriatic acid in a test tube and gently agitated, it turns blue; then, with evolution of nitric oxide and a sudden increase of temperature, decomposes, the result being a brownish resinous substance; the natural odour of the oil disappears, and the underlying acid changes to a red colour.

When the essential oil is in like manner poured upon the surface of hydrochloric acid and gently agitated, a gradual change in colour to deep blue results; in the course of twenty hours passes into violet, then changes to purple, and lastly to brown. The natural odour of the oil remains.

After distillation with water the root has a slight odour of the oil, an astringent taste, and a benumbing action upon the tongue.

Alcohol seems to extract all the sensible properties of the recently dried root. When percolated with this menstruum a dark reddish tincture results. Upon evaporating the alcohol from it at 150° F., the residuum separates into a reddish oil, B, and a stiff gummy substance, C.

Characteristics of the Oil, B.—It is heavier than water. The odour and taste are exactly like those imparted when the root is chewed. It dissolves in alcohol, ether, chloroform, and disulphide of carbon, but from the latter solution a small amount of flocculent reddish matter separates. When the solution in disulphide of carbon is filtered, a light-coloured oil results, seemingly similar to the essential oil A, obtained by distillation, the colour being somewhat darker. The flocculent red precipitate is astringent and deliquescent, absorbing moisture and forming a red liquid. It is the material that gives the red colour to the oil B, and constitutes a considerable proportion of the bulk of the—

Gummy Substance, C.—This is purified from adhering oil by trituration with carbon disulphide, the residuum being granular, astringent, and peppery, and of a brownish colour, soluble in dilute alcohol, and mostly soluble in glycerin. It dries by exposure to cool atmosphere, but melts to a varnish-like substance at the temperature of 125° F. to 150° F. When the dry powder is triturated with water a flocculent substance remains, astringent to the taste, soluble in glycerin, alcohol, and dilute alcohol; insoluble in chloroform, ether, and carbon disulphide; precipitates black from solution in glycerine and dilute alcohol, with ferrous sulphate, and is negative to action of the usual precipitants for alkaloids. The

filtrate from the precipitate C, after rubbing with water, is almost colourless, astringent, precipitates black with ferrous sulphate, and when boiled with Fehling's solutions yields a heavy red precipitate. It fails to respond to reagents for alkaloids. When the precipitate C is triturated with ether and chloroform, a portion dissolves, and an astringent substance remains, which deliquesces upon exposure, forming a red gummy substance, eventually liquefying. This seems to be the same as the substance that separated from the oil B by the action of carbon disulphide.

The residuum within the percolator, after extraction with alcohol, seemed thoroughly exhausted. Water and acidulated water are somewhat astringent after maceration with it, odourless, react with Fehling's solution, but not with tests for alkaloids. Ether and disulphide of carbon fail to extract a vegetable wax, resin, or other constituent worthy of attention; and inert extractive matter and mineral salts of no importance, together with woody matter, thus far have been found.

The Colouring Matter of Caryophyllaceous Plants. A. Hilger and H. Bischoff. (*Landwirthsch. Versuchs Stat.*, xxii., 456.) The authors have obtained optical and chemical evidence of the identity of the red colouring matters contained in *Phytolacca decandra*, *Beta vulgaris* (rubra), *Chenopodium quinoa*, *Amaranthus salicifolius*, and *A. portulaca*.

The Active Principle of Insect Powder. G. Dal Sie. (*Bull. Soc. Chim.* [2], xxxi., 542.) Persian insect powder consists of the flowers of *Pyrethrum caucasicum*, and other species. In 1878, Rother extracted from it an acid glucoside possessing anthelmintic properties. The author reports the isolation from an ethereal extract of the flowers of two acids, one of which is crystalline, while the other is an oily liquid of an aromatic odour. From the alcoholic extract he has obtained a resinous body having the properties of a glucoside. In his opinion the active principle of these flowers is a volatile acid existing in them in the free state.

Carica Papaya and Papayotin. Dr. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 361-373; *Pharm. Journ.*, 1879, 343-346, and 383-386; *Journ. Chem. Soc.*, 1880, 128-131.) The author gives a detailed description of the *Carica papaya*, or papaw tree, its growth and cultivation. The trees are dioecious and hermaphrodite; the hermaphrodite variety is called *mamao macho* (male mamao), the fruit-bearing variety *mamao fema* (female mamao) and a cultivated variety of the latter *mamao melao* (papaw-bearing mamao).

Fruit.—The fruit is gathered in the full-grown but unripe condition, when it contains a considerable quantity of a milky juice, which disappears almost entirely on ripening, and in the “mamao macho” is found a caoutchouc-like substance; in the “mamao femea” a soft yellow resin; and in the “mamao melao,” a dark reddish yellow fatty oil; these substances doubtless originated from the milky juice. The ripe fruit contained no free acid. The analyses of the fresh fruit of the three varieties freed from acid gave the following numbers:—

	Mamao femea.	Mamao melao.	Mamao macho.
Caoutchouc-like substance	—	—	0.046
Soft yellow Resin	0.165	—	—
Reddish yellow Fat	—	0.020	—
Albuminoids	1.070	0.500	0.735
Sugar	3.238	3.580	4.333
Pectinous matter	1.315		
Tartaric Acid } combined	0.075		
Citric Acid } with bases	0.020	0.483	2.332
Malic Acid }	0.083		
Dextrin, etc.	5.503		
Water.	85.351	92.500	89.445
Cellulose	3.180	2.920	5.091

The fresh fruit of the “mamao femea” gave 1.239 per cent. of ash, and the dried fruit, 8.457 per cent. It contains a large amount of soda, potash, and phosphoric acid.

Seeds.—The examination of the seeds is not yet completed, but a detailed account of the method of analysis is given. They are found to contain:—An oil, *papaya oil*; *caricin*, an oil-like substance with a disagreeable taste and smell, soluble in ether and alcohol; an acid similar to palmitic acid, *Carica fat acid*; a crystalline acid, *Papayic acid*, insoluble in cold water, but soluble in hot water and alcohol; a resin acid having an irritating and bitter taste, insoluble in water and ether, soluble in alcohol and alkalies; and a soft resin similar to that found in the fruit flesh of the “mamao femea.”

Milky Juice.—This juice occurs in all parts of the plant, but in quantity only in the unripe fruit. It is extracted with difficulty, the method being to make longitudinal incisions through the skin of the growing fruit, and as soon as one wound ceases to yield any juice, another is made; the gathered fruit yields only a few drops of juice. The milk resembles sheep’s milk, has a strongly acid reaction, and gelatinizes when mixed with three times its volume of water; it is without smell, and its taste is astringent and bitter:

its sp. gr. = 1.023 at 20°. Analyses of the milk were made in various ways.

1. The milk was repeatedly shaken with ether until nothing more was extracted. The ethereal solution, on evaporation, left a residue of wax, *mamao wax*. The residue, insoluble in ether, was treated with water and filtered; a caoutchouc-like substance remained on the filter; the filtrate was treated with absolute alcohol, when a white precipitate of *papayotin* was thrown down, which, when dried over calcium chloride, formed amorphous powder. The alcoholic filtrate contained a small quantity of extractive matter; 7.845 per cent. of *papayotin* was obtained by this method.

2. A quantity of the milk was evaporated to dryness, and the mass exhausted successively with ether, alcohol, and rectified spirit; the insoluble residue was dissolved in water, and alcohol added to the solution, when a light brown precipitate separated out of *parapapayotin* (5.338 per cent.), a substance formed by the decomposition of *papayotin* by heat.

3. The milk was mixed with four times its volume of water, filtered from insoluble matter, and the filtrate treated with absolute alcohol. The precipitate was dried over calcium chloride, and consisted of snow-white *papayotin* to the amount of 3.762 per cent.

4. The milk was exhausted repeatedly with warm water; the aqueous extracts concentrated, filtered, and precipitated with absolute alcohol; 4.304 per cent. of *papayotin* of a greyish colour was obtained.

5. The aqueous extracts of the milk were treated with lead acetate, the precipitates decomposed with sulphuretted hydrogen, and the filtered solution treated with absolute alcohol, in one case without and in another after concentration. A difference in the colour of the two products was all that was noticed.

Milk from the Stem.—The stem yields but a small quantity of milk, which had more the consistency of cream than that from the fruit. It contains 3.961 per cent. of snow-white *papayotin*.

Green Leaves.—The leaves yield 33 per cent. of a green juice which is treated with absolute alcohol and filtered; the residue washed free from chlorophyll, and exhausted with water; the solution, which contains impure *papayotin*, is precipitated with basic lead acetate, and the precipitate treated as in No. 5. A yield of .117 per cent. is obtained.

In the preparation of *papayotin*, strong heat should be avoided, to obtain an active product of a white colour. The best *papayotin* is obtained by method 1 or 3, or from the stem; the most advan-

tageous source, however, is the leaves, notwithstanding the small yield, since they can be obtained in large quantities. Papayotin is an amorphous, snow-white, non-hygroscopic powder, without smell, but with a slightly sweet, saline, astringent taste. It is insoluble in ether, alcohol, chloroform, and petroleum spirit, but soluble in glycerine and in water, nitric acid, and hydrochloric acid. Sulphuric acid colours it yellow; potash and soda colour it brown; and ammonia, yellow. An aqueous solution gave the following reactions:—White precipitates with alcohol, lead acetate, mercuric chloride, tannic acid, and sodium carbonate; with silver nitrate, a white turbidity, which, on standing, forms a deep yellow precipitate and a brown solution; iodine solution, a light-brown precipitate; ferric chloride, slight yellow precipitate; with phosphoric acid, on standing, a white precipitate; with Trommer's sugar test, a beautiful violet-blue, which, after boiling, became red-violet.

Papayotin readily dissolves roasted meat; .28 gram dissolved .2 gram meat in ten minutes. Parapayotin has no action on cooked meat, even when heat is applied. Papayotin coagulates milk very rapidly, as do those milk-juices of other Brazilian plants which have an acid reaction.

The fruit of the *Curica papaya* is used as a food, and the syrup formed by boiling the juice of the ripe fruit with sugar as a sedative and expectorant. The milky juice taken internally causes intestinal inflammation, but in small doses is given as a vermifuge, as are also the seeds. It is also used as a wash for the skin.

These results confirm those of Wittmack and Roy.

Analysis of Eriodictyon Californicum. C. Mohr. (Abstract of a paper read before the American Pharmaceutical Association.) The author's results show that the air-dried herb of this plant contains:—

Volatile Oil in small quantities, not further examined.	
Moisture	12.50
Matter extracted by ether	14.98
(Consisting of a bitter, acid, brittle resin, 8 per cent.; inert green colouring matter, caoutchouc, wax in small quantity, tannic acid in small quantity).	
Matter extracted by Alcohol	10.79
(Consisting of inert resinous matter decolorized by animal charcoal, a peculiar glucoside of the tannic acid series predominating in the mass).	
Matter extracted by Water	18.42
(Consisting of same tannic acid above mentioned, gum, brown extractive inert substance, trace of sugar).	
Wood fibre and Ash	43.31
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100.00	

From these results it is evident that the therapeutical value of the plant rests solely upon its stimulating and astringent effects upon the mucous membrane of the respiratory apparatus, especially the bronchial tubes, due to the action of the brittle acrid resin exciting secretion and promoting expectoration, the astringent tannic acid imparting tone and solidity to the membranes in a state of relaxation. How far in this respect the drug will prove to be equal or superior to the numerous remedies of like therapeutic effect, and how far its reputation amongst the people of the country where yerba santa is found indigenous is sustained when employed by the profession, must be decided by the practitioner.

For the preparation of the fluid extract, alcohol of 70 to 75 per cent. is recommended as the best menstruum.

Eriodictyon Californicum as a means of Disguising the Taste of Quinine. Dr. M. Kier. (From the *Pacific Surg. and Med. Journ.*) The author recommends an elixir or syrup of the yerba santa, (*Eriodictyon californicum*) as a palatable vehicle for disguising the taste of quinine and other bitter medicines. A fluid ounce of either of these preparations is sufficient for a ten-grain dose of sulphate of quinine.

Manna Production. J. Janssen. (*Pharm. Zeitschr.*, October 15th, 1879. From *Pharm. Journ.*) The planting of *Fraxinus* trees in Italy yields pecuniarily a good return, without any great trouble or cost being incurred. The best trees for planting are *Fraxinus Ornus*, L., and *F. excelsior*, L. The former species has been artificially introduced into Sicily and Calabria, though both species occur there growing wild.

When the tree has attained an age of eight to ten years, it is used in the production of manna. For this purpose a horizontal incision is made in the bark with a sharp garden knife, equal to about one-fifth of the entire breadth. In doing this the following points are observed. In the first year the incisions are made on the side of the tree towards which it inclines (the *Fraxinus* scarcely ever grows straight), and they always progress from below upwards. The first incision is made at the base of the tree, and then one incision over another, at intervals of one centimetre, until the ramification of the branches is reached. The incisions are then made on the opposite side, commencing at the base of the tree as before. From the beginning of July to the end of September an incision is made daily in each tree.

The manna is collected during nine years, when the tree becomes exhausted and incapable of production. For this reason, during the

ninth year incisions are made simultaneously on both sides of the tree, in order to use it up completely. The tree is now cut down, leaving only a single shoot, which, at the end of four or five years, is capable of production.

The juice which flows only from the incisions is at first brownish and has a bitterish taste, but after some hours in contact with air it becomes solid, whitish, and sweet, forming long pipes or small stalactites. But frequently the juice is very fluid, and then it runs down, forming a kind of long plaster that adheres to the bark, whilst a portion drops to the ground, where it is collected upon leaves of *Ficus Indica*.

The manna is collected once in the week and only in fine weather; if rain falls the gathering is hastened. Rain and dew interfere with the profits. A man provided with two vessels goes round to the trees, collects the pipes and scrapes off the smooth mass lying on the surface, putting each sort into a different vessel, as in commerce they have a very different value. The first sort is the "manna canellata," the second "manna in sorta." After the collection both sorts are spread out in the sun to dry a little, and then sent into commerce.

Adulteration of Beeswax. M. Buchner. (*Journ. Chem. Soc.*, August, 1879, from *Dingl. Polyt Journ.*) On account of the high price of beeswax, it is often largely contaminated with tale or resin. For several years cerosin has been added to beeswax in large quantities, as much as 33 to 50 p. c. having been found. This substance is a mixture of purified ozokerite and carnauba wax, and resembles beeswax in appearance. Its presence may be detected by the sp. gr.: that of the adulterated product being lower than that of pure beeswax. The sp. gr. of yellow raw beeswax is 0.959, of white wax, 0.955. Since carnauba wax imparts to cerosin its hardness, soft cerosin is lighter than the hard wax, the density of carnauba wax being 0.999. To detect admixture of cerosin, the wax is boiled in a test tube with a concentrated alcoholic solution of potash (1 pt. KHO in $2\frac{1}{2}$ to 3 pts. 90 p. c. alcohol) for a few minutes, and kept in the water-bath for some time to prevent the mixture from solidifying. The solution will remain clear if the wax is pure, but paraffin floats on the surface if it is adulterated with cerosin.

Bassia Longifolia. A. Riche and A. Rémont. (*Journ. de Pharm. et de Chim.*, 1880, 215.) *Bassia longifolia* is an East-Indian tree, belonging to the Order *Supotaceæ*. Its wood is very hard; its bark and leaves are used medicinally; its flowers have a very sweet

taste, and it seeds yield on boiling with water a solid fat which is known as "*illipe butter*."

The flowers, termed "*mowra*" by the natives, contain in the dried state 60 per cent. of fermentable sugar, of which about one-seventh is crystallizable. The dried flowers somewhat resemble dried grapes.

Illipe butter melts at 53° C., and is used for candles.

Bassia latifolia and *B. butyracea* also contain a solid fat, having a high melting point; that contained in the latter species is occasionally used as an article of food.

Bassia Parkii, an African tree, yields a fat known as "*galam butter*."

Japan Wax. A. Meyer. (From *New Remedies*, November, 1879.) It is only about twenty-five years since Japan wax found its way to Europe. From small insignificant samples which reached the London market about the year 1854, the quantity exported has reached very large figures at the present time. Japan, as well as China, produces this article, but the manner of production and even the true source of the Chinese article are still so much enveloped in doubt that no reliable data can be given. The author of the present paper, therefore, confined his investigations to the Japanese article.

Before entering upon a description of the latter, the author gives a list of such other vegetable tallow or fats as have been actually used, or might possibly be employed, as substitutes for Japan wax. The most important of these are the following:—

Carnauba wax, also called Ceará or Brazil wax, found upon the leaves of *Copernicia cerifera*, Mart. Native of Brazil. Forms a hard brittle mass, melting at 83·5–84° C.

Pela wax, or Chinese wax, is produced upon the young shoots of *Fraxinus chinensis*, Roxb., by the agency of an insect, viz., coccus pe-la, Westwood. It does not reach the European market. Melts at 82·5° C.

Koga wax, without doubt obtained from *Cinnamomum pedunculatum*, N. ab E., in Japan. Softer than Japan wax.

Ibota wax, produced by an insect upon *Ligustrum Ibota*, Sieb. Very firm and white. Neither of the two latter reach Europe.

Chinese vegetable tallow, *Stillingia* tallow, prepared from the seed-kernels, or more likely fruit-capsules, of *Stillingia sebifera*, Mart., in China. A rather soft, white, granular mass, chiefly used in China for making candles. Melts at 37° C.; according to the author, however, it does not melt completely until 45° C. is reached.

Palm wax, from the trunk of *Ceroxylon andicola*, Humb., of tropical America. When crude melts at over 100° C.

Myrica wax, or myrtle wax, from the fruit of *Myrica cerifera*, L. Melts at 47·5–49° C.

Japan wax may be distinguished from all of these by its physical and other properties. Formerly it was only imported in round cakes, of about 12 cm. ($4\frac{7}{8}$ inches) in diameter, and 2·5–3 cm. ($1\frac{3}{16}$ inches) in thickness; but at present it occurs also in square cakes, and in square blocks, the latter of about 65 kilos (143 pounds) each. When freshly broken the fractured surface is almost white, sometimes slightly yellowish green. At the surface they have a hoary appearance, owing to a shining, crystalline, white down. When freshly broken the odour is tallow-like and disagreeable. Occasionally dark yellow lots occur in the market. These fetch a lower price, and have the peculiarity that they turn darker relatively much more rapidly than the white variety. After being preserved for some time in a solid condition, the melting point of the fat is at 52–53° C.; but a recently solidified sample melts at exactly 42° C. The specific gravity of the bleached substance is somewhat above that of water. Boiling alcohol of 97 per cent. dissolves it easily, but deposits it nearly all again on cooling, retaining only 3 per cent. in solution. Warm ether likewise dissolves it readily, but deposits it in flakes or granular masses on cooling.

There are three principal sources of this fat or tallow in Japan, namely, *Rhus succedanea*, L., *Rhus vernicifera*, D.C., and *Rhus sylvestris*, Sieb. et Zucc. The latter, however, furnishes none of the commercial product, being only cultivated in some districts of Japan for domestic use.

Rhus succedanea, L., when fully developed, attains a height of about 9 metres ($29\frac{1}{2}$ feet), and has a short trunk, reaching a circumference of about 1 metre (39·4 in.). The stem or trunk is covered with a uniform grey bark, and has a yellow wood, which contains a bright sap, turning dark or black on exposure to air. The ramification is not profuse, and the leaves are placed close together at the ends of the branches. The colour of the leaves is a handsome green, turning to red in the autumn. They are about 15–20 cm. ($5\frac{3}{4}$ – $7\frac{3}{4}$ in.) long, imparipinnate, and have a round, naked petiole. The leaflets form four to six pairs, are opposite, naked, rather tender, and entire. Some samples are stated to have more or less serrated leaflets. The size of these are about 5–7 cm. in length, and 1·5–2·5 cm. in width. The flowers are mostly situated in the axis of the leaves, and form broad, multiflorous

panicles, which are, however, much shorter than the leaves. The flowers are dioecious, small, greenish yellow, and have a short peduncle.

Rhus vernicifera, D. C., attains a height of 8 to 12·5 metres (36 to 41 feet), and a girth of 1 m. (39·4 in.). The bark of the tree is grey and becomes fissured by age; the wood is greenish yellow. The leaves make their appearance in May, and fall off about the end of October, without first turning red. Their length is up to 30 cm. (12 in.). The leaflets are in pairs of four or five, entire, mostly opposite. The upper ones are elliptical, the lower pair oval and somewhat smaller; all have a short pointed apex, and generally an uneven base.

Neither *Rhus succedanea* nor *R. vernicifera* appear to be natives of Japan. Professor J. Rein, of Marburg, who has resided for some time in the country, thinks they are introduced from the Loochoo Islands. *R. sylvestris*, however, is a true native of Japan, and does not occur elsewhere.

The fruits of the above, and of many other species of *Rhus*, have a great similarity, being a drupe or stone-fruit, which in the case of *R. succedanea* is about 7 mm. long, 5 mm. broad, and 5 mm. high. The colour of its smooth, shining epidermis, when dry, varies from a dirty bright yellow to a light brown; when fresh, it is yellowish green. The vegetable fat or tallow is contained in firmly closed cells, which are loosely coherent, and are completely filled with the fat. For this reason the fat resists, while inclosed by the epidermis, the action of solvents, such as hot alcohol or ether, and even hot water. The shell incloses the embryo very tightly, and the whole fruit may be boiled with water for a long time before any fat is extracted from it. Mr. Meyer assayed ten fruits, which together weighed 1·51 grams. They consisted of 46·45 per cent. mesocarp, 42·35 per cent. epidermis and putamen, and 8·85 per cent. embryo, (with 2·35 per cent. loss). The quantity of fat extracted from the ground mesocarp by ether amounted to 20·9 per cent. of the whole weight of the fruit. The properties of the fat, whether obtained from the one or the other species of *Rhus*, are identical. It is brittle, bright yellowish green, and has the specific gravity 0·916. It melts at 52–53° C. when old, and at 42° C. when recently solidified. At 30° C. it is soluble in; about 700 parts of 97 per cent. alcohol.

From the various statements of eye-witnesses and existing reports on the process employed by the Japanese to extract the fat, Mr. Meyer concludes that the most usual plan is the following:—

The fruits are previously well dried, and then ground by means of mill-stones, or in mortars, with wooden pestles, or by bamboo flails. They are then freed by sifting and winnowing from shells and epidermis; sometimes, however, these latter are not separated. The mass is then heated over boiling water, in order to melt the fat in the cells, which is then expressed by means of different presses. During the second pressing, a little fatty oil is occasionally added to the mass, in order to retard the congelation of the fat. The crude tallow thus obtained is now boiled with dilute lye, whereby it becomes granular and more susceptible to the bleaching process; then exposed to the sun, and several times melted with water. The bleaching and melting is repeated until the product is pure and white.

Japan wax is chiefly used in Europe (and in the U.S.) as an admixture to beeswax in the manufacture of candles, as it facilitates the removal of the latter from the moulds; it is also used in the manufacture of wax matches. Shoe and furniture manufacturers likewise use it in considerable quantity as an ingredient in polishing materials. For pharmaceutical purposes (ointments) it is not well adapted, since it is, like bleached beeswax, already a rancid substance, and promotes the rapid deterioration of fats mixed with it. Perfumers, however, make use of it for preparing a castor oil pomade; a mixture of castor oil and Japan wax having the peculiar property of becoming entirely transparent by repeated melting.

Apiol. H. C. Whitney. (*New Remedies*, Jan., 1880.) The seed of *Apium Petroselinum* has variously been made the subject of research and analysis by different parties; prominent amongst them Messrs. Joret and Homolle, of Paris, who claim to have found therein, besides a crystallizable fatty matter, pectine (the apiin of Braconnot), chlorophyll, tannin, colouring and extractive matters, lignin, various salts, volatile oil, and a peculiar oily substance for which they proposed the name of apiol.

This is said to be a yellowish oily liquid, non-volatile, heavier than water, of a peculiar and tenacious odour, distinct from that of the plant, and of an acrid, pungent taste. They also claim it to be inflammable, insoluble in hot or cold water, very soluble in alcohol, and entirely dissolved by ether or chloroform. It is analogous to the fixed oils, but is not chemically changed by the alkalies.

The process given by them for obtaining the so-called apiol is as follows:—

They exhaust the seed with alcohol, treat the tincture with purified animal charcoal, distil off three-fourths of the alcohol,

treat the residue with ether or chloroform, evaporate the solution thus formed, mix the residuary liquid with an eighth of its weight of litharge, allow the mixture to rest twenty-four hours, and then filter through a thin layer of charcoal.

The author found, in reviewing this process, that the alcohol dissolves from the seed the apiin, essential oil, resin, and the supposed apiol.

After the treatment with ether or chloroform, the oil, resin, and apiol are separated from the pectine, and being mixed with an eighth of its weight of litharge for the purpose of removing what fat oil it may yet contain, besides the saponifiable resin, it is allowed to stand for a certain length of time and filtered, and the product thus obtained is what they named apiol. After the apiin is separated by ether or chloroform, and the fatty oil and resin by litharge, the mere act of filtering through charcoal certainly cannot separate the essential oil from the peculiar oily substance which they want to obtain, but must pass through the filter with it, so that what they obtain as pure apiol can only be an impure essential oil obtained by the absorption-process as lately proposed.

To substantiate this idea, the author took freshly powdered parsley seed, subjected it to repeated distillations with water until the latter passed entirely clear, obtaining thereby water strongly impregnated with the volatile oil of parsley seed. The oil at the bottom thereof being separated therefrom, the water was subjected to cohobation from a solution of sodium chloride, yielding the entire quantity of oil contained in the seed; which in this instance amounted to 4.27 per cent. The oil so derived corresponded closely to the so-called apiol of Joret and Homolle, with the exception of its being lighter in colour and evidently purer than theirs.

The residue of the distillation was strained while hot, separating the (by distillation) exhausted seed; the liquid yielding, upon being filtered, a large quantity of apiin on cooling. The residuary seed, being treated with petroleum benzine, gave 9.114 per cent. of a green fatty oil and liquid resin. Being subsequently subjected to the action of ether, gave 2.734 per cent. additionally of fatty oil and resin; the latter being separated, as in the former case, by shaking it with alcohol. The fatty oil, being entirely freed from resin, amounted to 7.239 per cent. The different portions of alcohol containing the resin, dissolved from the fatty oil, gave upon evaporation a greenish brown oily liquid, lighter than water and readily saponified by the fixed alkalis, with a peculiar odour distinct from

that of the essential oil, which in all but the latter respect differs from the apiol of Messrs. Joret and Homolle.

Of late, Mr. E. v. Gerichten (*Berichte der deutschen chemischen Gesellschaft*, Nos. 16, 17), claims to have found during his researches and investigations in parsley seed, a body for which he proposed the name of apiol, or parsley-camphor, and asserts that it is the only substance which is entitled to that name.

He finds that it is obtained during the distillation of the oil of parsley seed from the seed with water; which would be at a temperature not much above 212° F., whereas he subsequently claims for it a boiling point of 300° C. How this occurs the author confesses himself unable to understand, as during a number of experiments therewith, he failed to discover any separation of the fine needles of the parsley-camphor which E. v. Gerichten claims to have found.

The apiol or parsley-camphor of Mr. E. v. Gerichten must have been derived by a different process than described by him in his paper. It makes but little difference, however, for the apiol of Mr. E. v. Gerichten can be of little more than chemical interest, while the article of that name by Messrs. Joret and Homolle is that which is so much valued for its emmenagogue properties, and which alone finds therapeutical application. As the latter article is certainly nothing but a complex body, not saponifiable by fixed alkalies, which does not congeal at a temperature of 32° F.; and contrary to the statement of Messrs. Joret and Homolle, comes over almost entirely at a temperature of 212° F., the author is safe to say that it is principally composed of the essential oil of parsley seed intermixed with small quantities of a soft resin, which latter is in such minute quantities that the author can readily infer the emmenagogue properties to be contained in the volatile oil, and would suggest, therefore, that the apiol of the present be superseded by the term oil of parsley seed, which the medical profession no doubt will find to possess the same emmenagogue effect; or if such is not the case, that the soft resin, which is one of the constituents of the apiol of old, be separated by the process the author has above indicated, and employed for the purposes which apiol has been used for until now.

Curare. J. Crevaux. (*Journ. de Pharm. et de Chim.*, Feb., 1880.) The author has brought home from tropical America upwards of three kilograms of this arrow-poison, as well as the various plants used in its preparation, and a considerable quantity of the root and stem-bark of these plants.

He reports that the Indians employ for the preparation of curare

the barks and leaves of a great number of different plants, the majority of which, however, are inactive. The most active of those used in Guiana is *Strychnos Castelneve*. From the stem-bark of this plant the author prepared a curare ten times stronger in its effects than that of the Indians. The aqueous extract of the root-bark of this plant from Guiana is somewhat less active than that of the same species from Iça and Yapura.

Note on *Ervum Ervillia*, the Bitter Vetch. W. Southall. (*Pharm. Journ.*, 3rd series, ix, 481.) The author examined a sample of spurious peameal which had caused the death of fifteen pigs. Finding the ordinary poisons absent, he procured some of the seeds from which that meal was made, and which under the name of "Rovi seed" had been imported from Turkey. Plants grown from these seeds proved to be *Ervum Ervillia*, or bitter vetch. He subsequently heard of several other cases of pig poisoning by the same seeds.

The seed of *Ervum Ervillia* is about the same size and almost exactly the same rufous brown colour as that of the Egyptian lentils, *Ervum lens*; and when the testa is removed, both are of an orange-pinkish colour; but the former is not so bright as the latter. The seeds of *Ervum Ervillia* are not, however, lenticular, but obtusely triangular, and this serves to distinguish them from lentils, for which popular food they might be an unpleasant substitute.

A considerable portion of the author's paper is devoted to the botanical history of this plant.

Lupinus Luteus. H. C. Schulz. (*Bied. Centr.*, 1879, 874.) The seeds of the yellow lupine contain a crystallizable base of the formula $C_{10}H_{21}NO_2$, and two amorphous alkaloids corresponding to the formulæ $C_8H_{17}NO$, and $C_7H_{15}NO$. The crystallizable base fuses at $62.5^\circ C.$, boils at $270^\circ C.$, and is soluble in water. The presence of poisonous alkaloids in lupines accounts for the cases of cattle poisoning by these plants which have repeatedly occurred.

Nigella Sativa. H. G. Greenish. (*Pharm. Journ.*, 3rd series, x., 909-913, and 1013-1017.) This paper contains a full account of an elaborate analysis of the seeds of *Nigella sativa*. This analysis was undertaken by the author with the object of ascertaining what relation, if any, the chemical constituents of these seeds bear to those of the other members of the *Heleboræ* on the one hand, and of the *Pæoniæ* on the other, both being subdivisions of the order *Ranunculaceæ*. His results are briefly summarized as follows:—

100 parts of the Seed contain :

Moisture	7.43
Ash	4.14
Fixed Oil	37.00
Volatile Oil	1.64
Albumen (sol. in water)	8.22
Mucilage	1.90
Organic Acids ppt. by Cu	0.38
" " " Pb	0.59
Sugar (Glucose)	2.75
Arabic Acid ? (V. (a))	3.21
Undetermined substance	1.79
Albumen (sol. in soda)	2.14
Metarabin	1.36
Other substances dissolved by Soda	5.38
Melanthin	1.41
Traces of Oil, etc., removed by Alcohol	0.53
Dissolved by Chlorine Water and Sulphuric Acid	3.85
Removed by Chlorate of Potash and Nitric Acid	7.52
Cellulose	8.32
	<hr/>
	99.56

Conclusions.

The close analogy which the melanthin of *Nigella sativa* bears to the helleborin of the botanically nearly related *Helleborus*, carries out the anticipation of Dragendorff, that plants naturally closely allied frequently contain similar important constituents. At the same time, the well-defined alkaloids which characterize *Delphinium* and *Aconitum* appear in *Nigella* to be entirely unrepresented. Possibly a connecting link could be found in the fat acids of the staves-acre seeds, which have not as yet been subjected to a thorough investigation, just as the presence of myristic acid in the *Nigella* seeds points to the *Myristicaceæ* as not standing far removed.

The pæoniofluorescin of Dragendorff and Stahre differs from the fluorescent substance of *Nigella* in its insolubility in petroleum ether. The presence, however, of a substance resembling the phlobaphens has been shown, and although no tannin could be found, it may be regarded as resulting from the decomposition of a body belonging to that class.

Noteworthy in the seeds is the presence of volatile oil, which in *Ranunculaceæ* is generally absent. Connecting this with the fact that *Nigella* is one of the few ranunculaceous annuals, and de-

pendent therefore on its seeds for its propagation, it does not appear improbable that the antiseptic ethereal oil should act, in the universal "struggle for existence," as an additional protection to the seed. The yield of melanthin from Russian seeds was much greater than that from German seeds, owing, probably, to the different circumstances under which these seeds were grown. Melanthin, like saponin, possesses considerable emulsifying properties, and is probably of service in the secretion of the fixed oil.

The Migration of Plants from Europe to America, with an Attempt to Explain certain Phenomena connected therewith. E. W. Claypole. (Abstracted from a paper read before the Montreal Horticultural Society, and printed in the *Pharm. Journ.*, 3rd series, x., 404-407, and 464-468.) The instances brought forward by the author are chiefly those of migration from England to America, and *vice versâ*. The conclusions arrived at are as follows:—

1. That many of the weeds of Europe have migrated to America.
2. That many of these have become so thoroughly naturalized there that they prevail over some of the plants native to the soil.

3. That only two or three American weeds have crossed the Atlantic and become naturalized in England.

4. That the difference of climate and the conditions of mutual commerce do not fully account for this marked difference in the migrative power of the two floras.

5. That in the Miocene era the European and American floras were very much alike.

6. That since that era the European flora has been vastly altered, while the American flora still retains a Miocene aspect, and is therefore the older of the two.

7. That this long persistence of type in the American flora may have induced, by habit, a rigidity or indisposition to change in the American flora.

8. That the changes in the European flora since the Miocene age betray a plasticity of nature, or power of adapting itself to circumstances, of which the American flora gives no sign.

9. That in this view the European flora is better able to adapt itself to the strange climate and conditions—that is, to emigrate—than the American flora.

10. That being thus more plastic or adaptable, it succeeds in the New World, while the less adaptable American flora fails in the Old World.

Cusco Bark. Dr. O. Hesse. (*Liebig's Annalen*, cc. 302.) The

continuation of the author's researches on this variety of cinchona bark has led to the isolation of two new alkaloids, *cuscamine* and *cuscamidine*. The sample of bark from which they were obtained yielded '78 per cent. of these bases, together with '21 per cent. of aricine and '35 per cent. of cusconidine. The absence of quinine, cinchonine, quinamine, and paricine is one of the characteristic features of the *cinchona pelletieriana*, the species yielding this bark.

From an acetic acid solution of the alkaloids of cusco bark these new bases are precipitated as nitrates by the addition of nitric acid. On converting the nitrates into oxalates, and treating the latter with water, cuscamine oxalate is left undissolved, while cuscamidine oxalate passes into solution. The bases themselves can be readily prepared from their oxalates.

Cuscamine crystallizes from boiling alcohol in colourless prisms, melting at 218°C . With sulphuric acid it forms a yellowish solution changing to brown on warming, and with nitric acid a yellow solution which undergoes no change on standing. The addition of molybdic acid to the sulphuric acid solution produces a bluish green coloration, which changes to brown on heating, and to violet-brown on allowing the heated mixture to cool. The salts of this base described by the author are the hydrochlorate, aurochloride, platino-chloride, hydrobromate, hydriodate, nitrate, sulphate, and oxalate.

Cuscamidine is precipitated by nitric acid from concentrated solutions only, and differs in this respect from cuscamine, the nitrate of which is readily precipitable from weaker solutions. In its physical properties it closely resembles cuscamine.

Notes on Cinchona Bark. D. Howard. (*Pharm. Journ.*, 3rd series, x., 181; and *Journ. Chem. Soc.*, March, 1880, 177.) The author has been enabled to compare the proportion of quinine and other alkaloids contained in the "natural" bark and in that formed by "renewing," i.e., growing after the artificial removal of the bark. This renewed bark is termed "mossed bark," because the tree after being stripped of its bark, is usually protected by a covering of moss whilst fresh bark is being formed. The natural bark was found to be generally inferior to the mossed bark, since it had been collected either from the upper stem, or from inferior old trees, whereas the mossed bark represents the product of the main stems of the oldest trees. As far as the effect of age was concerned, it was found that both the quinine and total crystallizable alkaloid steadily increased in quantity with the age of the trees; this is probably due to the greater maturity of the trees. The trees from

which the bark was taken were specimens of *Cinchona officinalis*. The author, on the other hand, confirms from recent experience an opinion previously expressed, that the bark of *succirubra* deteriorates in quality when the tree has passed a certain age. Root bark shows a marked tendency to develop the dextrogyrate alkaloids. A sample of renewed bark which had been formed without "mossing," or any kind of protection, was also examined, and was found equal in quality to the best mossed bark; hence it appears that the only advantage of mossing is to enable the tree to form bark again with a minimum injury to its health; the process does not appear to improve the quality of bark formed. The author also compares the proportions of alkaloids contained in outer and inner bark. The outer bark not only contains a larger quantity of alkaloids, but these contain a larger proportion of quinine; hence it has been suggested to shave off only the outer layers, without cutting quite through the bark.

Phytolacca Decandra. E. Claasson. (*New Remedies*, 1870, 326.) The seeds of poke-berries (the fruit of *Phytolacca decandra*, L.) contain an indifferent crystallizable principle which the author has named *phytolaccin*, and which is obtained in the following manner:—The pulverized seeds of the poke-berries are treated several times with alcohol, the alcohol is removed from the filtrate by distillation, the residue washed with some petroleum ether (gasoline or petroleum benzine), to remove adhering oil, then perfectly dried on the water-bath, finely pulverized, and extracted by means of concentrated ether (or chloroform). The ethereal solution leaves behind, after distillation from the water-bath, a syrup-like liquid filled with acicular crystals which, after separation from the mother-liquor, can be obtained perfectly white and pure by recrystallization or washing with a little alcohol. Phytolaccin is tasteless and colourless, and crystallizes in acicular silky prisms, mostly forming radiated tufts. It is insoluble in water, but easily soluble in alcohol, particularly when hot; ether and chloroform dissolve it very easily, and petroleum somewhat difficultly, even when hot. Diluted acids, as well as concentrated acetic and hydrochloric acids, ammonia or solution of sodium hydrate, do not dissolve it, even at the boiling point. Cold concentrated sulphuric acid, however, dissolves it with brownish yellow colour, turning brownish red when the solution is heated. Concentrated nitric acid, when cold, has no effect on phytolaccin; but when heated it dissolves, assuming at the same time a yellow colour. From a solution in alcohol or in ether, the phytolaccin falls down on addition of water as a flocculent precipitate.

When heated it melts, then turns brown and afterwards black, and finally burns up completely. It contains no nitrogen.

Jacutupé: Pachyrrhizus Angulatus. **SYNONYMS:** **Dolichos Articulatum; Dolichus Bulbosus; Tæniocarpum Articulatum.** Dr. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 193-197, and 209-213.) This plant belongs to the *Leguminosæ*, sub-order *Papilionaceæ*, and is a native of Brazil. Its tubers are used as an article of food, and also as a source of starch. The author, who resides at Rio de Janeiro, has made an analysis of the tubers, showing them to have the following composition:—

Constituents in 1000 parts of the Fresh Tubers (peeled).

Gluten	7.99
Albuminoid Substance	2.40
Fat	0.90
Starch	65.14
Brown Resin	2.33
Glucose	22.59
Extractive	10.77
Jacutupin (crystallized)	0.67
Jacutupinic Acid (crystallized)	0.55
Pachyrrhizic Acid (crystallized)	0.10
Mucus, Dextrin, Pectic Substances, and Organic Salts	8.25
Water	861.04
Ash	17.26

The jacutupin may be isolated as follows:—The fresh tubers are exhausted with boiling alcohol of 80 per cent. strength, and the united solutions distilled to recover the alcohol. The residue is dissolved in water, the filtered solution treated with lead acetate, the precipitate formed removed by filtration, the filtrate next treated with tribasic lead acetate and again filtered, the clear liquor freed from lead by sulphuretted hydrogen, then evaporated to the consistence of a syrup, and the residue allowed to stand for some time. The crystals of jacutupin thus obtained are purified by repeated recrystallization from boiling alcohol. The precipitate produced by the tribasic acetate of lead, when suspended in water and decomposed by sulphuretted hydrogen, yields crystals of jacutupinic acid on evaporation of the filtered solution.

Jacutupin crystallizes from hot alcohol in the form of snow-white, small, silky needles, which are readily soluble in cold water, nitric acid, and hydrochloric acid, slowly soluble in sulphuric acid, and insoluble in ether and in solution of ammonia. From its solution

in water it crystallizes in wart-like masses. The aqueous solution is neutral to test paper, forms a gelatinous precipitate with potassium hydrate and white precipitates with mercuric chloride and silver nitrate, and does not reduce Fehling's solution. In many of its properties it resembles mannite.

The dried tubers do not yield any jacutupin. The juice of the fresh tubers may be advantageously employed for its preparation, provided it is used immediately after its expression, as otherwise it rapidly undergoes a fermentation by which the jacutupin is wholly converted into jacutupinic acid. From juice which had been kept for thirty-six hours at the temperature of the air (at Rio de Janeiro), the author obtained a good supply of this acid and not a trace of jacutupin.

The starch of jacutupé is used medicinally in vesical catarrh and other affections of the bladder.

The seeds of this plant are regarded by the natives as poisonous; but in the author's opinion, based on their chemical examination and physiological experiments, the supposition is erroneous.

Baptisia Tinctoria. Dr. F. V. Greene. (*Amer. Journ. of Pharm.*, 1879, 577, and *Journ. Chem. Soc.*, 188, 401.) Failing to isolate the alkaloid of *Baptisia tinctoria*, either by the method of Smedley (*Amer. Journ. Pharm.*, 1862, 310) or of J. A. Warner (*ibid.*, 1871, 251), the following method was adopted:—The powdered root is exhausted with water, the extract evaporated with calcined magnesia, the dried residue extracted with alcohol (95 per cent.), and the solution concentrated; distilled water is added, and filtered from precipitated resin. To the filtrate tannic acid is added, which precipitates the alkaloid; the precipitate is intimately mixed with lead oxide, dried, and exhausted with ether. On evaporating the solution a resinous mass is left, from which the pure alkaloid is separated by means of oleic acid at 100°. The oily solution is poured off and treated with benzin (? petroleum), which dissolves the oleate and excess of acid. This solution is shaken with water, acidulated with hydrochloric acid, and on standing acicular crystals separate out from the acid solution.

Octahedral crystals may be obtained by treating the root with sodium bicarbonate and evaporating the extract to dryness. The residue is exhausted with ether, the ether evaporated, the mass treated with water and filtered; after neutralizing the aqueous solution with hydrochloric acid and extracting the colouring matter with ether, the solution is allowed to crystallize.

The alkaloid gives a precipitate with Mayer's reagent, potas-

sium iodo-iodide, potassio-cadmium iodide, phosphomolybdic acid, sodium phosphotungstate, tannic and picric acids. It is soluble in water, alcohol, and ether, but insoluble in benzene and chloroform.

Baptisia Tinctoria as a Remedy for Typhoid Fever. Dr. H. Hager. (*Pharm. Centralhalle*, 1879, 438.) A tincture of the root of *Baptisia tinctoria* has been very successfully used by Dr. Johnson in a number of cases of typhoid fever. It was administered in doses of one to five drops every one to four hours, together with milk and stimulants. The external treatment consisted in the application of cool water washings. Delirium and diarrhœa were almost entirely prevented, and the temperatures of the patients rapidly lowered. Seven cases thus treated, including three very severe ones, proceeded most satisfactorily.

The root has a nauseous taste, and should only be used in the dried state, as the fresh root is liable to cause purging and vomiting. According to Dr. Rosenthal, the dried root has formerly been employed as an antiseptic in scarlet and typhoid fevers, and also as a substitute for quinine.

Composition of Hops. L. Siervert. (*Bied. Centr.*, 1879, 54.) The author's analyses of eleven samples of hops from West Prussia shows the following variations in the proportion of constituents:—

Moisture.	. . . . .	9.90 to 13.90
Sand	. . . . .	1.46 „ 2.90
Ash	. . . . .	5.72 „ 8.40
Organic Matter	. . . . .	75.80 „ 81.90
Fibre	. . . . .	15.20 „ 18.20
Albuminoids	. . . . .	13.39 „ 16.01
Tannin	. . . . .	0.83 „ 1.50
Soluble in Ether	. . . . .	11.30 „ 19.03
Soluble in Alcohol (after extraction with ether)	. . . . .	10.19 „ 17.20
Total Extract (ethereal and alco- holic)	. . . . .	21.49 „ 34.66
Alcoholic Extract (obtained without previous treatment with ether)	. . . . .	26.33 „ 33.23

In the author's opinion, the proportion of ethereal extract is a good criterion of the quality of hops. In good samples it should not fall much short of 20 per cent.

Cinnamon and Cassia. O. Hehner. (*Analyst*, 1879, 225.) The alleged difference in the behaviour of decoctions of cinnamon and

cassia towards iodine cannot be used as a distinguishing test, since decoctions of both cassia and the cheaper kinds of cinnamon turn blue with this reagent. In the case of cassia the reaction is obtained more readily than with cinnamon, but the difference is not such as to render it available as a test. The finest samples of cinnamon do not react much with iodine, probably because, on account of their immaturity, they contain but little real starch.

To find, if possible, some real chemical difference between the two barks, the author examined their mineral constituents, believing that cassia, the more woody bark, would contain a larger amount of salts of lime and magnesia than the delicate membranous cinnamon. The following analyses show, however, that this supposition was not entirely substantiated. An analysis was made upon the ash obtained at the lowest possible temperature, but not recarbonated:—

	CINNAMON.			CASSIA.	
	Per lb.	1/10	3/-	3/6	Lignea. Vern.
Carbon. . . .		0.27	0.41	0.31	1.26 —
Sand		1.09	0.53	0.52	3.16 0.24
Si O ₂		0.27	0.31	0.25	0.90 0.20
C O ₂		29.29	32.27	32.40	27.18 36.26
P ₂ O ₅		3.52	2.20	3.00	3.67 1.13
S O ₃		2.42	2.73	2.84	2.02 0.71
Cl		0.18	0.51	0.76	0.14 0.09
Fe ₂ O ₃		0.78	0.41	0.46	1.23 0.14
Mn ₂ O ₄		0.86	0.97	0.13	5.11 1.13
Ca O		40.09	36.98	40.39	25.29 52.72
Mg O		2.65	3.30	3.86	5.48 1.10
K ₂ O		14.22	16.70	10.35	20.58 5.60
Na ₂ O		3.98	2.97	4.65	3.98 0.90
<hr/>					
Ash. . . .		99.62 4.78	100.29 4.59	99.92 4.66	100.00 1.84
					100.16 4.08

	WHOLE CINNAMON.					CINNAMON CHIPS (containing wood.)
	1/10	3/-	3/6	3/6	6/-	9d.
Retail, per lb.						
Moisture . . .	12.67	12.05	11.88	11.64	12.94	11.25
Ash in Bark . .	4.78	4.59	4.66	3.44	4.28	4.44
Lime in Ash . .	40.09	36.98	40.39	34.32	36.99	42.11
Mn ₂ O ₄	0.86	0.97	0.13	0.62	0.59	0.34
Soluble Ash . .	25.04	28.98	25.22	26.36	27.67	18.34
Insoluble Ash .	74.96	71.02	74.78	73.64	72.33	81.66

	CASSIA LIGNEA.			CASSIA VERA.	
	Whole.		Ground.		
Moisture . . .	14·22	11·88	11·05	10·37	11·36
Ash in Bark . .	1·84	2·54	2·55	4·08	4·85
Lime in Ash . .	25·29	34·49	28·63	52·72	43·40
Mn ₂ O ₄	5·11	4·94	3·55	1·13	1·53
Soluble Ash . .	40·58	26·78	30·91	8·36	15·89
Insoluble Ash. .	59·42	73·22	69·09	91·64	84·11

Examining these figures, it appears: 1. That the *proportion of ash* in cinnamon fluctuates between comparatively narrow limits. *Cassia vera* contains an amount equal to that of cinnamon, but *C. lignea* yields much less. 2. That the amount of *ash soluble in water* is about one-quarter of cinnamon ash, less in *C. vera*, more in *C. lignea*. 3. That cinnamon ash contains less than one per cent. of *oxide of manganese*, *C. vera* upwards of one per cent., *C. lignea* far more, up to five per cent. This is indeed the most noteworthy feature brought out by the analysis. The amount of manganese has a direct influence upon the colour of the ashes. Thus all cinnamon ashes are *white*, or nearly so; those of both descriptions of cassia *grey* or *brown*; and the latter, when heated with hydrochloric acid, yield an abundance of chlorine gas. Thus the amount of manganese serves to distinguish cinnamon from *C. lignea* with a high degree of probability, and even a comparatively moderate admixture of the latter would thus be rendered evident in the former. The manganese is most readily separated from the ash by means of bromine after the phosphate of iron has been precipitated by acetate of soda.

The difference between cinnamon and *Cassia vera* is not so marked, but the low proportion of soluble ash in this is a point worthy of notice. But *C. vera* is only important to a very small extent, and it is, as an adulterant or substitute, of far less importance than the cassia commonly so-called, namely *C. lignea*. It is, moreover, so mucilaginous, that when heated with water it yields a glairy orropy decoction.

The Constituents of Viola Tricolor. Prof. Dragendorff. (*New Remedies*, 1880, 146.) The author communicates some preliminary results of an analysis of *Viola tricolor* carried out by Mr. Mandelin.

The aqueous extracts of the plant having been concentrated to the consistence of honey, and mucilage and salts having been separated, as much as possible, by precipitation with alcohol, the

resulting solution was deprived of alcohol by distillation, and the residue shaken with ether, which left, on evaporation, a crystalline substance. This was purified by repeated crystallizations from hot water, and afterwards alcohol and ether. When perfectly pure, it had all the properties and reactions of salicylic acid, and was proved to be this substance by proximate analysis. Another substance, so far separated by Mr. Mandelin, is tartrate of magnesium.

Salicylic acid, as such, has so far been extracted only very rarely from plants. It occurs, however, more frequently in the form of some of its derivatives; for instance, the methyl-salicylic acid. The only known instance in which salicylic acid appears to have been extracted from a plant (the flowers of *Spiraea Ulmaria*, L.) is slightly doubtful, for this reason, that the existence of the acid, as such, in the plant, was not absolutely proved; and hence, that it might have been formed by oxidation from salicylous acid during the process of extraction. In *Viola tricolor*, however, it may be assumed that salicylic acid, as such, is present, which acts as an antiseptic, and is one of the causes that the plant may be preserved over the winter without difficulty.

Xanthoxylum Carolianum. G. H. Colton. (*Amer. Journ. of Pharm.*, 1880, 191.) According to the author's analysis the bark of this plant contains a crystallizable resin, an amorphous acid resin, a trace of volatile oil, 12.4 per cent. of ash, and a bitter principle showing all the characters of an alkaloid. This base is soluble in alcohol and water, but insoluble in benzin, ether, and chloroform. With concentrated nitric acid it produces a bright red colour, which slowly fades to yellow; with sulphuric acid it forms a purplish brown solution. Molybdate of ammonium, dissolved in sulphuric acid, produces a purplish colour with tinge of brown, changing to red, then orange, and finally pale yellow. The aqueous solution formed precipitates with all the ordinary alkaloidal reagents.

Micania Guaco. Dr. H. Hager. (*Pharm. Centrallhalle*, 1879, 438.) Dr. G. van Schmitt has recently revived the use of this West Indian plant by employing it as a remedy for cancer, and claims to have obtained brilliant successes with it. Long ago its juice was used as a prophylactic for snake bite; and both the juice and tincture were administered for intermittent fever, rheumatism, gout, spasms, hydrophobia, syphilis, and cholera.

Chian Turpentine. W. Martindale. (*Pharm. Journ.*, 3rd series, x., 854.) This drug, the oleo-resin from *Pestacia terebinthus*, after being almost forgotten, has suddenly come into use again and met with an extraordinary demand, in consequence of the success-

ful results obtained with it in the treatment of uterine cancer by Professor Clay, of Queen's Hospital, Birmingham. A full report of these results will be found in the *Lancet* of March 27th, 1880.

Chian turpentine has been omitted from the British Pharmacopœias, but was official in the London Pharmacopœias. Royle states that it used to be taken chiefly to Venice, where it was in request for making the far-famed Theriaca. Pereira, Guibourt, and Hanbury describe it, and their descriptions are rather conflicting. It has a very firm, honey-like consistence, yet is slightly brittle, and becomes more so with age and exposure to the air, and even then it always takes the form of the vessel in which it is kept. It is translucent, small pieces appear yellow or brownish yellow, but in mass it has a greenish brown colour. It has, when fresh, a distinctive odour, slightly like the pinaceous turpentines, but much more agreeable and aromatic, according to some resembling citron and jasmine; but there is always a background smell like that of mastic, which becomes more developed and distinct with age, when it has lost the more volatile portion, the essential oil. According to Pereira, the turpentine-like odour is combined with the odour of fennel, and Guibourt says, when kept in a covered glass vessel the odour is strong and agreeable, analogous to that of fennel or the resin of elemi. The author has only seen one sample which had an odour at all resembling fennel. It probably loses this rapidly. A specimen, bearing Guibourt's name, in the Pharmaceutical Society's Museum, has now no trace of it, but the mastic odour is very persistent. If the fennel odour be very evident in it, the sample is probably not genuine, as in a statement made in the *Lancet*, the writer says, what is sold as Chian turpentine "is either greatly adulterated, or a wholly fictitious article manufactured from black resin, Canada balsam, and the essential oils of fennel and juniper." The taste of genuine Chian turpentine resembles that of mastic; it is agreeable, and free from the characteristic bitterness and acidity of the pinaceous turpentines.

From its mode of collection, even the genuine Chian turpentine is always contaminated with impurities, earthy dust, etc. Testing a number of what the author believed to be genuine samples, as well as some not genuine, he found them all (mechanical impurities excepted) entirely soluble in ether and absolute alcohol. The alcoholic solution of Chian turpentine reddens litmus paper. The pimaric acid of Canada balsam is not soluble in cold absolute alcohol, but admixture with other ingredients might render it so. The author is not acquainted with any definite test for its purity.

In judging of its genuineness, one must rely on its taste, odour, and physical characters as above described. It should, more especially, be not too fluid. The drug was considered by Dioscorides to be diuretic, stomachic, and laxative.

For its administration three forms have been employed by Professor Clay, viz., pills, an ethereal solution, and an emulsion made from the latter. The pills consist of 3 grains of Chian turpentine and 2 grains of sulphur in each. The ethereal solution is made by dissolving 1 ounce of Chian turpentine in 2 fluid ounces of absolute ether. From this solution an emulsion is prepared as follows:—

R.	Ethereal solution of Chian Turpentine	fl. ʒss.
	Solution (mucilage) of Tragacanth	fl. ʒiv.
	Syrup	fl. ʒj.
	Sublimed Sulphur	grs. xl.
	Water to	fl. ʒxvj.

Mix.

The sulphur appears to have been added because it was not wished to lose anything contained in the pills which had previously been proved to be of such service. The sulphur will separate from such a mixture and aggregate the resin in masses, first to the top and then at the bottom of the bottle. By using mucilage of acacia in place of mucilage of tragacanth, a satisfactory mixture may be obtained by first putting the mucilage into the bottle, adding the turpentine solution, shaking, and diluting with a little water; then rubbing the sulphur with the syrup, pouring into the bottle, filling up gradually with water, and shaking after each addition.

Notes on Chian Turpentine. R. Modlen. (*Pharm. Journ.*, 3rd series, x., 913.) This paper is a valuable *résumé* of the history of Chian turpentine, collected from standard works and other publications. For the details we must refer the reader to the original article in the *Pharmaceutical Journal*.

The Pharmacy of Chian Turpentine. R. H. Parker. (*Pharm. Journ.*, 3rd series, x., 1027.) At present this drug is administered in two forms, viz., in pills and emulsion. Professor Clay's formula for the pills is, 3 grains of Chian turpentine and 2 grains of sulphur.

A tolerably firm sample of the drug must be used, or the pills will require much hardening excipient, and be inconveniently large. When fresh it is said to be of the consistence of honey. This would be useless for pills, and it should be exposed in shallow vessels in a warm air chamber until sufficiently inspissated. Such procedure, of course, entails loss of volatile oil, but a sample hardened by old

age could not be objected to; moreover, the medicinal activity would probably vary less than that of some of our potent official extracts, *e.g.*, belladonna, nux vomica, etc., with their varying degrees of consistence and composition.

The Chian turpentine being fairly hard, it is easily made into pills by the use of a warm mortar or slab, the sulphur being incorporated, with the addition, if necessary, of a little powdered liquorice or marsh-mallow, to enable the pills to retain their form. If the pills are to be coated, they should be made tolerably hard, and allowed to stand some time, with occasional rounding, and then covered with very fine French chalk by means of thin mucilage of tragacanth or white of egg.

The emulsion is made with a solution of Chian turpentine in ether of such strength that 2 fluid ounces contain 1 ounce of the turpentine. Professor Clay's formula is:—

Solution of Chian Turpentine	℥ss.
Mucilage of Tragacanth	℥iv.
Syrup	℥j.
Sublimed Sulphur	grs. xl.
Water to	℥xvj.

Dose: 1 ounce three times a day.

The mucilage should be quite fresh, but the tragacanth must be thoroughly diffused. As the formula stands, the best *modus operandi* is to dilute the mucilage with about half of the water, throw in the whole of the turpentine solution, agitate gently, add the remainder of the water and the sulphur, previously rubbed down with the syrup.

If the mucilage be not fresh, or the sulphur be added before the turpentine, the latter will aggregate into a sticky mass with the sulphur, and adhere to the side of the bottle.

Another method is to triturate the turpentine solution in a mortar with powdered tragacanth, gradually add the water and other ingredients as above. This gives a good result, but scarcely better than that obtained by the first process.

Almond mixture gives a far nicer emulsion, and if sweetened with spirit of chloroform keeps well. With this excipient, suggested by Mr. Branson, it should be made as follows:—

℞ Compound Almond Powder	℥ss.
Solution of Chian Turpentine	℥ss.
Spirit of Chloroform	℥iv.
Sublimed Sulphur	gr. xl.
Water to	℥xv

Triturate the powder with a little of the water, add the solution of turpentine and the remainder of the ingredients.

The facility with which emulsions are made with gum-resins induced the author to try to make an artificial gum-resin of Chian turpentine, by incorporating with it, while in a fluid state in a hot mortar, a sufficient quantity of powdered acacia gum to render it hard and pulverizable when cold. By triturating this powder with water an emulsion is produced in which the tendency of the oleo-resin to aggregate is completely overcome; and even if largely diluted, the resin subsides as a white sediment, which may be readily diffused by gentle agitation.

The addition of a small quantity of powdered tragacanth with the acacia is perhaps an advantage, as it gives an emulsion in which there is less tendency for the resinous particles to subside. The requisite quantity of powdered gum must of course vary with the consistence of the oleo-resin. The following are the proportions used by the author:—

℞ Tereb. Chia	. . . . .	5j.
Pulv. Tragacanth.	. . . . .	5ss.
Pulv. Acaciæ	. . . . .	5iiss.

The mixture should be allowed to remain for some time until thoroughly set, so that it may be easily reduced to a fine powder. It is then made into a thin paste with a little water, and triturated until perfectly emulsified. This emulsion is by far the most perfect of any produced.

The tasteless character of Chian turpentine would indicate an electuary as a very convenient form for its exhibition. The following formula gives an elegant preparation:—

℞ Tereb. Chia	. . . . .	5j.
Spirit. Rectif.	. . . . .	5ij.
Pulv. Acaciæ	. . . . .	5j.
Pulv. Glycyrrh	. . . . .	5j.
Conf. Rosæ Caninæ	. . . . .	5j.

The dose may be from half to one teaspoonful.

The oleo-resin is dissolved by warming with the alcohol, and triturated in a mortar with the powdered gum; the liquorice is then added, and finally the confection of hips.

The emulsion made from the artificial gum-resin and the electuary are decidedly the best forms for its administration. The emulsion with almond mixture is the most convenient for dispensing, that

with the artificial gum-resin being somewhat tedious. Pills of almost entirely resinous composition are always of doubtful solubility, especially if hard, as these must be in order to retain their form.

Chemical Examination of four Samples of Chian Turpentine. G. W. Wigner. (*Analyst*, 1880, 112.) The first sample examined (obtained from Messrs. Allen & Hanburys) was very probably a portion of that referred to in *Pharmacographia*, and would, in that case, be at least ten years old. It was of an opaque, yellowish brown colour, rather softer than a pill mass, slightly sticky, and covered on the surface with a whitish powder. A small portion was melted and dropped into cold water, so as to form tears, and the sp. gr. of these tears was found to be 1050 at 60° F. One of these fragments, when gradually heated in water to the boiling point, melted and expanded rapidly, became lighter than the water, and floated as a film on the surface.

With the exception of a small amount of mineral impurities, consisting chiefly of sand, it dissolved readily in boiling alcohol 60 o. p., which becomes slightly milky when cold. The resin is precipitated as a white powder on dilution with water.

Absolute alcohol dissolved it readily, even in the cold; so also did ether, chloroform, and bisulphide of carbon. Petroleum spirit and turpentine dissolved it readily on warming, and wood naphtha slowly dissolved it on warming, the latter solution became slightly milky on cooling.

A portion was distilled with water for the volatile oil, which was found to amount to a little over 9 per cent.

A 20 per cent. solution of the turpentine itself was examined in the polariscope, and gave a right-handed rotation of 9° 12' in a tube 200 m.m. long for the sodium ray.

The essential oil from the same solution gave a rotation of 1° 54' for the sodium ray, leaving 7° 18' as the rotation due to resinous constituents.

The sample contained two different resins, one of which saponified readily with carbonate of soda, and the other with somewhat more difficulty, but formed a far less soluble soap. This latter was present in by far the larger quantity; and from its appearance and character it appeared to correspond pretty closely with the alpha resin of mastic.

Dividing these resins as far as possible according to their solubility, the sample was found to have the following composition:—

Volatile Oil	9.2 per cent.
Alpha Resin	79.0 "
Gamma Resin	4.0 "
Benzoic Acid	traces.
Impurities, chiefly sand	7.3 per cent.

99.5

The second sample examined by the author was a portion of a new supply just received in this country, but coming through almost the same channel as the first one. It was of course newer, and probably from that cause somewhat softer; the brittle characteristic of the original sample was, however, strongly marked, and the tears, which had been produced by letting a few drops fall into the water, were sufficiently brittle to break when allowed to fall on the table.

A 20 per cent. solution, examined in the polariscope with a sodium flame gave a rotation of $7^{\circ} 46'$, of which $1^{\circ} 54'$ was due to the volatile oil, and the difference $5^{\circ} 52'$ to the resin. Apparently, therefore, there was some slight difference in the optical rotatory power of the resin in this sample.

Saponified and treated like the previous sample, it gave the following results:—

Volatile Oil	9.2 per cent.
Alpha Resin	81.0 "
Gamma Resin	6.0 "
Benzoic Acid	traces.
Impurities, ash	1.4 per cent.
" woody fibre	2.0 "

99.6

The sp. gr. of this sample was 1052, or rather higher than the old one.

A third sample, of very similar appearance, was procured in London from another source. This was probably old, although perhaps not so old as the first sample above referred to.

The sp. gr. was 1043. The rotation in the polariscope was practically identical with the first sample. The analysis showed, however, a large percentage of volatile oil, viz., 12.1 per cent., and it contained a mere trace of ash, and a smaller proportion of impurities. This, which was to all appearance, a genuine sample, was evidently more carefully collected.

A fourth sample, also purchased from a London wholesale house, was obviously a spurious one. In colour, appearance, and smell it

closely resembled Canada balsam; it was softer and far more tenacious than genuine Chian turpentine, so sticky, in fact, that it was with difficulty it could be removed from the fingers. When a portion was rubbed on the hand the smell was extremely pungent and persistent. The sp. gr. was 1000, or exactly identical with water at 60° F. In connection with this, it should be borne in mind that the sp. gr. of Canada balsam is less than water, some samples being as low as 970. Its rotatory power in the polariscope was 6° 15' for a 20 per cent. solution in a tube 200 mm. long; that is, it was only about two-thirds of the rotation of the genuine samples, and the rotation due to the volatile oil was 3° 36', leaving only 2° 39' due to the rotation of the resin, or less than half that of the genuine samples. The solubility in alcohol, ether, chloroform, petroleum spirit, naphtha, bisulphide of carbon, and turpentine showed no difference from the genuine samples which were capable of being used for discrimination. It appeared to contain about 70 per cent. of a resin which corresponded in some respects to the alpha resin found in the genuine samples, but was of a darker colour, and formed a much harder and more brittle soap, while the author could not trace the slightest trace of benzoic acid. In the author's opinion this sample was mainly a mixture of colophony and Canada balsam.

Thapsia Garganica and Thapsia Resin. C. Blanchet. (*Pharm. Journ.*, 3rd series, x., 889.) The *Thapsia garganica* is an umbelliferous plant which during recent years has attracted considerable attention in France, it yielding a rubefacient resin that has been made the basis of numerous preparations. Among the Arabs it is now known under the designation "bou-nêfa" (god of health), but in the time of Dioscorides it was called "dritz." In the present day the inhabitants of the Cyrenaican district call it "dérias," and the Kabyles use it under the name "deriés." A few years since it was alleged that the plant known to the inhabitants of the Cyrenaican district as "drias" was the real silphion plant of the ancients, and Dr. Laval who collected the plant, described it as a new species, to which he gave the name *Silphium Cyrenaicum*. This claim, however, was refuted in an exhaustive treatise by M. Henricq, who demonstrated that the plant was identical with the *Thapsia garganica* of Southern Europe. The author of the present paper, in the course of a lengthy section on the botany of the plant, expresses his agreement with the conclusions of M. Henricq.

The root-bark of the *Thapsia garganica* is largely used as a medicine by the Arabs and Kabyles, internally against leanness, chronic

diseases of the lungs, and sterility ; and externally as a remedy for rheumatic pains, gout, coughs, bruises, eruptions, etc.

The root-bark of *thapsia* is not met with in European commerce. In the dry state it occurs in small unequal fragments, 4 to 10 millimetres thick, friable and brownish yellow on the external surface, which is sometimes smooth, and sometimes has more or less deep wrinkles that mark out small, prominent, convex, irregularly quadrilateral spaces. The internal surface is white, chalky-looking, often spotted red or brown, and finely striated longitudinally. The fresh surface of a section often exhibits a very clear golden yellow resin, which is found also in the internal crevices of the bark. The fracture is granular and compact. Examined with a glass it appears riddled with closely approximating, concentrically arranged, yellow-walled pores, amongst which is interposed the white chalky-looking tissue that forms the greater part of the mass. The bark retains for a long time the petiolar *débris*, represented by rosettes of fibres.

Together with the *Thapsia garganica* there grows another umbelliferous plant, called by the Arabs "cleka," and by the Europeans "false thapsia." This is referred by the author to *Ferula nodiflora*, Linn. (*F. communis*, Desf., *F. densa*, Delil.). The root of this plant is perennial, fleshy, greyish, nearly black on the exterior, and contains an abundance of an acrid milky juice, devoid of any vesicating action. Deprived of the ligneous portion and dried it presents a great resemblance to the bark of *Thapsia garganica*, and is now largely substituted by the Arabs for it. When the root is in a fresh state this fraud may be detected under the microscope. In the thapsia the primary interior layer of the liber is constituted by a series of broken concentric lines ; in the cleka the layer is formed by a continuous line, and the resinous canals, which are regularly distributed, appear especially in the interior, whilst in the thapsia they are found especially in the exterior of the liber layer. When dry these characters can no longer be detected, and dependence must be placed on the colour of the external surface, which in the thapsia is brownish yellow, and in the cleka greyish and nearly black. After the barks have been dried a long time, however, exfoliation takes place, and the sophistication is difficult to determine.

The first recorded chemical examination of the root of *Thapsia garganica* was made by M. Stanislas Martin, who reported that he had found in it a rubefacient resin, tannin, starch, extractive, lime, ligneous matter and "thapsic acid." The author of the present memoir, however, gives his reasons for suspecting that the "thapsic

acid" was really hydrochloric acid. Another analysis of *Thapsia garganica* root was made by M. Yvon in 1877 (see *Year-Book of Pharmacy*, 1878, p. 249). M. Blanchet also has made partial analyses of the dried and fresh bark, 90 per cent. alcohol being used to separate the resin, with the following result:—

	Dried Bark Collected in January, 1879.		Fresh Bark.	
Water	0.00	—	89.70	80.70
Organic Matters	91.85	—	17.75	—
Starch	—	20.52	—	4.41
Gum and Colouring Matters . . .	—	7.32	—	1.47
Resins	—	5.55	—	2.15
Matters soluble in Alcohol and in Water	—	1.38	—	2.40
Elements not estimated	—	57.08	—	7.32
Inorganic Matters	8.15	8.15	1.55	1.55
	100.00	100.00	100.00	100.00

From these results it appears that the bark from fresh roots, which lose 80 per cent. of their weight in drying, yield 2 per cent. of resin; whilst bark that has been dried one year yields only 5.55 per cent. This M. Blanchet considers to be due to the oxidation of part of the resin, in which state it is no longer soluble in the alcohol. In the absence of a supply of newly dried bark no experiment could be made as to its resin value.

These results, however, do not quite agree with those reported by other authors. M. Beslier, following the process of the Codex, obtained from the fresh roots about 2 per cent. of resin, from the same roots dried in a stove at a moderate temperature an average of 10 per cent., and from the bark completely dried, about 15 per cent. On the other hand, M. Nielli, treating the fresh roots with 90 per cent. alcohol, obtained an average yield of about $4\frac{1}{2}$ per cent., whilst the dried bark only yielded a little more than 5 per cent. According to this last result, as at least four parts of fresh bark are required to make one part of dry bark, there would be a great loss of active substance during drying. It appears, however, that as a matter of convenience, and to avoid loss of alcohol, M. Nielli uses the dried bark in manufacturing operations.

Some comparative experiments made to ascertain the relative value of 90 per cent. alcohol, ether, and carbon bisulphide as solvents

of the resin, showed that the alcohol was the best solvent, ether came next, and carbon bisulphide last.

Pure thapsia resin is brown; it has an acid reaction, which it communicates to distilled water after a few minutes' contact at boiling temperature. The resin burns with a bright flame. When treated with sulphuric, nitric, or hydrochloric acid in the cold, it gives no marked reaction.

The directions in the Codex for the preparation of the thapsia resin are to wash the bark with hot water, dry and cut it, and then to treat it several times with boiling 90 per cent. alcohol until it is completely exhausted; the liquors are afterwards united, and the alcohol distilled off by means of a water-bath. The residuary resin is purified by redissolving it in cold 90 per cent. alcohol, filtering the solution, and distilling until the residue has acquired the consistence of honey, in which state it is suitable for the preparation of the plaster and revulsive sparadrap.

M. Nileli, a pharmacien, of Philippeville, Algeria, who prepares this resin on a large scale, uses cold water instead of hot to wash the bark before drying, and after the first distillation submits the resin to repeated washings with boiling water until extractive and gummy matters are completely removed, and then treats it with 96 per cent. alcohol.

Since the crude resin sometimes contains as much as two-fifths of its weight of substances soluble in water, the treatment with boiling water is of considerable advantage.

The activity of the resin is so excessive, that in spite of all precautions, during the treatment with alcohol, and especially during the evaporation of the alcohol, it is impossible entirely to prevent inconvenience to the operator. Even to remain a few minutes in the place where the operation is being carried on is sufficient to provoke a rather painful feeling of heat, which is localized generally in the neck, the eyelids, and below the lobes of the ears.

The reducing of the bark to a coarse powder and the handling of the latter to put it into the apparatus, are the operations that require most care and are most dreaded by the Arab workmen. It is very difficult to persuade the workmen to undertake the work a second time, as from the first hour it causes a very intense swelling, notwithstanding that they fasten cloths closely across their mouths and nostrils.

According to M. Blanchet thapsia plaster applied to the skin exercises a special action. The skin is irritated, heated, and reddened, and becomes the seat of an extremely lively itching. This

is followed by an eruption of very numerous and closely approximated miliary vesicles, full of purulent serous matter. When the application has been continued for only a short time, the vesicles continue to develop during some days, then they wither, assume a darker colour, dry, and form small thin scales that soon exfoliate. When the action of the resin is continued for a longer time, the vesicles become confluent, burst, and together form an ulcerating and suppurating surface, but without any true blister, in which the action of this resin is distinguished essentially from that of cantharides. The ulcerated vesicles dry up after a few hours, and become covered with light squamæ that fall off without leaving any trace on the skin. The application of thapsia plaster is said to be beneficial, especially where it is desired to produce a revulsive effect in rheumatism, bronchitis, pleurodynia, pleurisy, etc., the length of the application being made dependent upon the amount of effect desired to be produced.

There is a formula given in the Codex for the preparation of the "sparadrap revulsif." Another formula, given by M. Desnoix, is as follows:—

Colophony	1,500 parts.
Elemi	1,250 „
Yellow Wax	1,800 „
Turpentine	500 „
Thapsia Resin	550 „

Melt the colophony, elemi, and yellow wax, add the turpentine and thapsia resin, strain through linen and spread.

A resin is also obtained by treating the "cleka," or "false thapsia," with 90 per cent. alcohol. It is yellowish brown, and, like thapsia resin, is soluble in alcohol, ether, and carbon bisulphide. The resin is, however, entirely without rubefacient effects. It gives no characteristic reactions with sulphuric, nitric, or hydrochloric acid.

Notes on Cantharides. H. G. Greenish. (*Pharm. Journ.*, 3rd series, x., 729.) The author shows that the exhaustion of Spanish flies with ether or alcohol is insufficient for the complete extraction of the cantharidin, as this mode of treatment leaves a considerable proportion of the active principle undissolved. As a much more satisfactory mode of estimating the percentage of cantharidin, he recommends a process indicated by Professor Dragendorff in his "Werthbestimmung," which he briefly describes as follows:—

25 to 30 grams of the powdered flies are freed from oil by treatment with petroleum ether. Cantharidin being not insoluble in

petroleum ether, a correction must be made in the amount of cantharidin found to compensate for the loss incurred by treatment with this solvent. This loss has been determined by Dragendorff to be for 100 c.c. petroleum ether 0.0108 gram cantharidin.

The flies freed from oil are now thoroughly moistened with solution of soda, and the mass thus produced dried in a porcelain dish on the water-bath. By this treatment, during which quantities of ammonia gas are evolved, a soluble cantharidate of soda is formed, which is subsequently decomposed by hydrochloric acid. It must be borne in mind that not all the cantharidin in the flies is present in the free state. Dragendorff has shown that cantharides containing about 0.3 per cent. cantharidin yielded only half that quantity to boiling water, the remainder being extracted by solution of potash. Among the combinations of cantharidin insoluble in water occur probably salts of lime and magnesia; among the soluble, cantharidic acid, possibly cantharidate of ammonia, etc. (the ammonia being derived from the albuminous substances by their decomposition during the drying of the flies).

The dried mass (containing now cantharidate of soda) is removed from the dish and finely powdered. It is then transferred to a flask, 25–30 grams of chloroform added, and the whole rendered strongly acid by the addition of dilute hydrochloric acid. This is then well shaken with from 25–30 grams of pure ether, the ether-chloroform solution separated and shaken with distilled water. The shaking with ether is repeated until cantharidin ceases to pass into solution. The major part of the ether can be recovered by distillation, the residue being allowed to evaporate to dryness in a flat bottomed glass dish. This residue is then transferred with the aid of a small quantity of absolute alcohol to a tared filter, and washed first with alcohol and then with two or three cubic centimetres of water. Should traces of oil still adhere to the cantharidin, they may be removed by washing with petroleum ether. The quantities of these liquids used must be noted, since a slight correction has to be made, viz., for 10 c.c. alcohol 0.0077 gram, for 1 c.c. water 0.0005 gram. The washed cantharidin is dried at 100° C., weighed, and the corrections for petroleum ether, alcohol, and water added to the figure so found.

In a sample of cantharides, the good quality of which was considered doubtful from their failure to produce a sufficiently active Drouett's plaster, the author found by this process .746 per cent. of cantharidin, a proportion which is largely in excess of that found by Dragendorff in good samples of Spanish flies, viz., .35 to .5 per cent.

In the author's opinion, the entire amount of cantharidin contained in the flies may be rendered active by the aid of soda or potash. He suggests the following treatment:—The finely powdered flies are mixed to a paste with dilute alkaline lye of about 1·1 sp. gr., heated in the water-bath for twenty-five to thirty minutes, when sufficient muriatic acid is added to have a trifling surplus of the same, and the whole mass is dried rapidly in the water-bath. The residue, which we may call prepared cantharides, is powdered anew, and employed for the preparation of the plaster, or for the extract with acetic ether for use upon tissue.

The attention of manufacturing druggists is called to cantharides residues as profitable sources of cantharidin, especially in cases where simple solvents, such as ether or alcohol, have been used for the extraction. The marc from *tinctura cantharides*, for instance, contains a considerable proportion of cantharidin.

In conclusion, the author points out that other species of *Cantharis* may excel *Cantharis vesicatoria* with regard to the amount of cantharidin contained in them. In a sample of dried *Cantharis adspersa* he found as much as 2·5 per cent. of cantharidin. Noticeable in this sample was the comparatively small quantity of fixed oil (2·6 per cent.).

Balsamum Antarthriticum Indicum. Dr. B. Hirsch. (*Archiv der Pharm.* [3], xv., 27.) The author has examined specimens of this balsam and of two other preparations, named *wapa balsam* and *oil of wapa* respectively, together with the wood of *Eperna fulcata*, said to be the source of these three substances. The balsams and oil showed sufficient resemblance in their chemical and physical properties to warrant the conclusion that all were obtained from the same source. The wood he examined was without bark and pith, and in that condition gave no indications showing that it could produce these balsams without the addition of other materials.

Eugenia Cheken. A. Borchers. (*Ber. der deutsch. chem. Ges.*, xii., 2111.) This plant belongs to the Order *Myrtaceæ*, and is a native of Chili. The author recommends inhalations of the vapours rising from its aqueous infusion as a valuable remedy for diphtheritis, laryngitis, and bronchitis. Internally administered the infusion and extract are said to be useful in the treatment of indigestion, and affections of the bowels and kidneys.

The Ethereal Extract of Aspidium Marginale. G. W. Kennedy. (*Proc. Amer. Pharm. Assoc.*) Four fluid ounces of the extract were prepared, and of this three-fourths were given to four physicians, with the request that they would watch its action closely, and re-

port the results at their earliest convenience. Only one physician has, thus far, had occasion to use the oleo-resin, with which twelve feet at one time, and ten feet at another, in all twenty-two feet of tapeworm were expelled. Since that time the patient has not complained, and the doctor believes that the head was discharged. A friend, who has been annoyed with tænia for some time, has been treated with kamala (*Rottlera tinctoria*) and cusso (*Brayera anthelmintica*) with unsatisfactory results, discharging only small pieces of the worm. The administration of the ethereal extract of *Aspidium marginale* caused the expulsion of a piece eight feet long.

The extract was administered in the following way:—One and a half fluid drachms were placed in a two-ounce vial, half filled with granulated sugar, well shaken; filled with water, and again well shaken. The patient, after fasting about twenty-four hours, at 10 o'clock p.m. took one-third; at 11 o'clock p.m. one-third, and at 6 o'clock next morning the balance, which was followed, two hours afterwards, with a large dose of castor oil. The parasite, or a portion of it, was expelled in a few hours.

Three experiments were made with the view of ascertaining the amount of ethereal extract the drug would yield, one pound being operated upon at each experiment. In each case the yield was about one and a half ounces, or 9·375 per cent.

Previous notices of *Aspidium marginale* will be found in the *Year-Book of Pharmacy*, 1876, p. 209, and 1878, p. 202.

Notes on Indian Drugs. W. Dymock. (*Pharm. Journ.*, 3rd series, x., pp. 121-123, 281-282, 381-382, 401-403, 461-463, 581-582, 661-662, 829-831. and 993-994.) The drugs described by the author comprise the following:—

Spilanthes oleracea, Linn. (*Compositæ*). Para cress of Brazil. Vernacular: Akurkura (Bomb.).

Artemisia Indica, Willd. (*Compositæ*). The plant. Vernacular: Nagdown (Hind., Beng.); Dauna (Bomb); Machipatri (Tam.).

Artemisia Sternutatoria. The plant. Vernacular: Nakk-chiknee (Hind., Beng., and Bomb.).

Doronicum Scorpiodes (*Compositæ*)? The rhizome. Vernacular: Darunaj-i-akrabi (Pers., Bomb.).

Tricholepis procumbens, Wight, Ic. (*Compositæ*). Plant. Vernacular: Badaward (Pers. and Bomb.).

Nyctanthes arbor tristis, Linn. (*Jasminaceæ*). Flowers, leaves, and fruit. Vernacular: Harsinghar (Hind.); Siuli (Beng.); Partak (Bomb.); Pagala mullai (Tam.).

Calotropis gigantea, R.Br.; *Calotropis procera*, R.Br. (*Asclepiadææ*).

The root, leaves, and flowers. Vernacular: Ak, Mudar (Hind.); Akanda (Beng.); Akra, Rui (Bomb.); Erukku Erukkam (Tam.).

Ophioxylon Serpentinum, Linn. (*Apocynææ*). The root. Vernacular: Chota-chand (Hind.); Chandra (Beng.); Harkai (Bomb.); Patalagandhi (Tel.).

The *Allamanda Aubletii* (*Cathartica*), Linn. (*Apocynææ*).

Carissa corumulas, Linn. (*Apocynææ*). The root. Vernacular: Karonda, Karaunda (Hind.); Karwand Karinda (Bomb.); Karamcha (Beng.); Kalaka (Tam.).

Strychnos potatorum, Linn. fil. (*Loganiaceæ*). The seeds. Vernacular: Nirmali (Hind., Beng., Bomb.); Tetran-Kottai (Tam.).

Strychnos colubrina, Linn. (*Loganiaceæ*). The root and wood. Vernacular: Naga-musadi (Tel.); Modira-coniram (Mal.); Kuchilalata (Hind., Beng.); Goagari-lakri (Bomb.).

Phyllanthus niruri, Linn.; *Phyllanthus urinaria*, Linn. (*Euphorbiaceæ*). The plants. Vernacular: (*P. niruri*), Jarāmla (Hind.); Bhuiāmla (Beng.); Bhui-aunla (Bomb.); Kizhikāynelli (Tam.). *P. urinaria* bears the same names, with the addition of the adjective red.

Zarāwand-i-gird (Pers. and Bomb.), *Aristolochiaceæ*.

Zarāwand-i-tawil (Pers. and Bomb.), *Aristolochiaceæ*.

Croton oblongifolium, Roxb. (*Euphorbiaceæ*). The root bark. Vernacular: Baragach (Beng.); Ganasur (Bomb.); Gonsurong (Goa.).

Euphorbia nerifolia, Linn. (*Euphorbiaceæ*). The juice and root. Vernacular: Schund, Thohar (Hind.); Mansasij (Beng.); Newerang, Mingut (Bomb.); Ilaik-kalli (Tam.).

Phyllanthus emblica, Linn. (*Euphorbiaceæ*). The fruit. Vernacular: Anvula (Hind.); Amlaki (Beng.); Avalkati, Awla (Bomb.); Toppi (Tam.).

Hippion orientale (*Gentianææ*), Syn., *Stevoglia orientalis*, Grisebach; *Cicendia hyssopifolia*, W. and A. Vernacular: Chota Kira-yata (Hind.); Mameejwa (Bomb.).

Gul-i-ghāfith, *Gentianææ*.

Kanturiyan, *Gentianææ* (?).

Ipomœa Turpethum, R. Br. (*Convolvulaceæ*). The stem and root. Vernacular: Nisot, Nakpatar, Pitohri (Hind.); Nishotar (Bomb.); Shivadai (Tam.); Teori (Beng.).

Batatus paniculata, Choisy. (*Convolvulaceæ*). The root. Vernacular: Bibai-kand (Hind.); Bhui-kumra (Beng.); Bhui-kohala (Bomb.); Mattapal-tiga (Tel.); Phal-modecca (Mal.).

Cordia myxa, Linn.; *C. latifolia*, Roxb. (*Boraginaceæ*). The

fruit. Vernacular: Lasora (Hind.); Bahubára (Beng.); Bhokar, Sapistán (Bomb.); Naruvilli (Tam.).

Herpestis Monniera, H. B. et. K. (*Scrophulariaceæ*). The herb. Vernacular: Brahmi (Hind., Beng.); Nir-brami (Tam.).

Barleria prionitis, Linn. (*Acanthaceæ*). Karumtaka (Sans.); Katsareya (Hind.); Kantajuti (Beng.); Kalsunda (Bomb.); Shem-múlli, Varamúlli (Tam.).

Justicia ecbolium, Linn. (*Acanthaceæ*). Udwjati (Hind.); Rán-obeli (Bomb.).

Acanthodium spicatum, Delile (?) (*Acanthaceæ*). The seeds. Vernacular: Utangan (Hind.); Utinjan (Bomb.).

Leonotis nepetafolia, Br. (*Labiata*). Hejurchei (Beng.); Matijer, Matisúl (Bomb.).

Vitex Sp. (?) (*Verbenaceæ*). Hab-ul-fakad (Arab.); Tukm-i-panjangusht (Pers.); Sambhaloo-ka-bij (Hind. and Bomb.).

Plumbago Zeylanica, Linn. (*Plumbagineæ*). The root. Vernacular: Chitrak (Hind.); Chita (Beng.); Chitra (Bomb.); Chit-tira (Tam.).

Datura alba, Rumph.; *D. fastuosa*, Linn. (*Solanaceæ*). The root, leaves, and seeds. Vernacular: Safed-dhatura (Hind., Bomb., Beng.); Urnattai (Tam.).

Solanum jacquinii, Linn. (*Solanaceæ*). The plant. Vernacular: Bhatkatya, Katái, Ringni (Hind.); Bhu-ringni (Bomb.); Kandan-kattiri (Tam.); Kantakári (Beng.).

Solanum Indicum, Linn. (*Solanaceæ*). Birhatta (Hind.); Moti-ringni (Bomb.); Mulli (Tam.); Byákura (Beng.).

Solanum nigrum, Linn. (*Solanaceæ*). The plant. Vernacular: Makoi (Hind.); Kamuni, Ghati (Bomb.); Manattak-kali (Tam.); Kákmáchi (Beng.).

Gen. ? Sp. ? (*Solanaceæ*). Local name, Sanipát.

Emex, *Sp. ?* (*Polygonaceæ*). The herb. Vernacular: Shukái (Hind., Bomb.).

Rumex vesicarius, Linn. Chuka (Hind., Beng., Bomb.); Chukra (Sans.).

Acalypha Indica, Linn. (*Euphorbiaceæ*). The plant. Vernacular: Kuppi, Kokli (Bomb.); Kuppai-meni (Tam.).

Pokli-miri (*Piperaceæ*).

Myrica sapida, Wall. (*Myricæ*). The bark. Vernacular: Kai-phal (Hind., Bomb., Beng.); Marudam-pattai (Tam.).

Piper longum, Linn. (*Piperaceæ*). The fruit and root. Vernacular: Pipli (Hind., Bomb., Beng.); Tippi-li-mulam (Tam.).

Salix caprea, Linn. (*Amentaceæ*). The flowers. Vernacular: Béd-mushk (Pers. and Hind.). The distilled water, *Ma-ul-khilaf*.

Betula bhojpatra, Wall. (*Amentaceæ*). Bhurjapatra (Sans); Bhujpatr (Hind., Beng., Bomb.).

Kishmish-i-káwalyan, or *Muizak-i-ásli* (*Loranthaceæ*?).

Pinus longifolia, Roxb. (*Conifera*). The wood and turpentine. Vernacular: Saral, Chir (Hind.). The turpentine: Gandah-birozah (Hind. and Bomb.).

Zingiber Cassumunar, Roxb. (*Anomaceæ*). The rhizome. Vernacular: Ban-ada (Hind. and Beng.); Neesan (Bomb.) Karpush poo (Teling.).

Curcuma Sp. ? (*Anomaceæ*). The rhizome. Vernacular: Ambé-haldi, Jangli-haldi (Hind., Beng., Bomb.) ; Kasturi-manjal (Tam.)? Kattu-mannar (Malay) ?

Curcuma aromatica, Salis. (*Anomaceæ*). The rhizome. Vernacular: Kachoorā (Hind., Beng., Bomb.).

Curcuma Sp. (*Anomaceæ*). The rhizome. Vernacular: Nar-kachoorā (Hind., Bomb.).

Alpinia officinarum, Hance (*Anomaceæ*). The rhizome. Vernacular: Chota-kulijan, Chotépanki-jar (Hind., Beng., Bomb.); Shitta-rattia (Tam.).

Hedychiium spicatum, Smith (*Anomaceæ*). The rhizome. Vernacular: Kafur-kachri, Kapoor-kachri (Hind., Beng., Bomb.); Shimai-kiechilik-kizhangu (Tam.).

Kämpferia rotunda, Linn. (*Anomaceæ*). Bhuichampa of India.

Eulophia, several species (*Orchidaceæ*, *Salep*). Vernacular: Saalab-misri (Hind.); Sháli-mishiri (Tam.); Sálam-misri (Bomb); Chálé-miehhri (Beng.).

Vanda Roxburghii, R. Br. (*Orchidaceæ*). The roots. Vernacular: Rasna (Hind., Beng., Bomb.).

Iris Germanica, Linn. (*Iridaceæ*). The rhizome. Vernacular: Birk-i-banafshah (Pers.), Irsa.

PHARMACY.

PART III.

PHARMACY.

Dialysed Iron. M. Personne. (*Journ. de Pharm. et de Chim.*, Oct. 1879, 332.) This preparation, though commonly announced to be a pure ferric oxide in a soluble form, always contains a considerable proportion of ferric chloride, and generally also some ferric sulphate, and is thus far from what it is represented to be. In other respects it differs from ordinary sesquioxide of iron, in being insoluble in acids and having a lower specific heat. The fact that it cannot pass through the membranes in the same manner as crystalloids, that it is precipitated by acids and saline solutions, and, above all, that it is quite insoluble in the gastric juice, induces the author to regard the preparation as medicinally inactive. Of its utter insolubility in the gastric juice he has fully satisfied himself by experiments on dogs. He also points out that when this modified form of ferric oxide was first discovered, its freedom from astringency marked it out as a valuable medicinal preparation; but on trial it was soon abandoned as worthless. Its subsequent revival and present popularity are attributed by the author to the effective wholesale and misleading advertisements.

The Diffusive Properties of some Preparations of Iron. Prof. Redwood. (From a paper read before the Pharmaceutical Society, March 3rd, 1880, and printed in the *Pharm. Journ.*, 3rd series, ix., 709-712). M. Personne's recent statement to the effect that dialysed iron is incapable of being absorbed during its passage through the intestinal canal, and therefore inactive (see the foregoing article), led the author to infer that if this inactivity be due in any measure to the colloidal state of the iron, it might be expected that other preparations of iron would, to some extent at any rate, owe their activity as medicinal agents to their diffusive properties. As the scaly preparations of iron agree with dialysed iron in their freedom from inky taste and astringency, and in their incapability of crystallizing, it might be supposed that these scaly preparations are either colloidal, like dialysed iron, or at least that they are deficient in diffusive power; for colloids are usually marked by absence or

deficiency of taste. These considerations induced the author to make the diffusive power of iron preparations the subject of an experimental investigation.

The dialyser used in the experiments consisted of a glass jar, the membrane-covered mouth of which was $5\frac{1}{2}$ inches in diameter; and this rested in the mouth of a white earthen dish. Two thousand grain measures of either a 5 per cent. or a 10 per cent. solution of the salt used were put into the glass jar, and 25 ounces of water into the dish. The diffusate was usually removed at the expiration of two, but sometimes of three days, at the commencement of an experiment, although a longer time was allowed for each separate diffusion when the action became sluggish towards the end of an experiment.

The first series of experiments were made with ferric citrate obtained by saturating solution of citric acid with freshly precipitated ferric hydrate, and evaporating in the usual way. The results are given in the following tabulated statement:—

200 grains of Citrate, containing 64·58 grains of Fe_2O_3 in dialyser.

Days.	Amount of Salt Diffused.	Amount of Fe_2O_3 in Diffusate.	Percent. of Salt Diffused.	Percent. of Fe_2O_3 in Diffusate.
2	51·26	22·45	25·63	43·75
4	44·81	19·45	22·41	45·63
4	20·50	8·67	10·25	42·26
5	9·02	4·10	4·51	45·45
14	6·37	3·68	3·18	57·77
29	131·96	58·35	65·98	
	(Residue in Dialyser.)			Percent. Fe_2O_3 in Residue.
	4·86	2·75	—	56·65.
Total . .	136·82	61·10		
Loss . .	63·18	3·48		
	200·00	64·58		

The table shows an apparent loss in the process of 63·18 grains of salt, but only a loss of 3·48 grains of Fe_2O_3 , the latter probably arising from adhesion to the septum. No entire cessation of diffusion was observed.

The next set of experiments was made with four samples of ammonio-citrate of iron, marked 2 a, 2 b, 2 c, and 2 d, and containing 30·21, 30·9, 30·65, and again 30·65 per cent. of Fe_2O_3 . Nos. 2 c and

2*d* were both the same sample, but the one was used in pure aqueous solution, and the other (2*d*) in a solution rendered strongly alkaline by ammonia. The following table shows the principal results of dialysis in these four experiments :—

Ten per cent. Solutions (200 grains of Ammonio-citrate of Iron in 2000 grains of Solution) Dialysed for Six Days.

	Amount of Salt Diffused.	Percent. of Salt Diffused.	Percent. of Fe_2O_3 in Diffusate.	Diffusion on Sixth day.	Percent. of Fe_2O_3 Salt not Diffused.
(2 <i>a</i>)	150·38	75·19	28·2	not ended	61·61
(2 <i>b</i>)	146·30	73·15	29·5	not ended	52·48
(2 <i>c</i>)	123·71	61·85	32·7	ended	69·49
(2 <i>d</i>)	110·20	55·10	35·5	ended	68·38

Having observed that diffusion stopped when the salt in the dialyser became highly basic, and that the diffusate as well as the contents of the dialyser became more and more basic as the process proceeded, the author next tried to ascertain whether with a salt containing less than the usual proportion of oxide of iron, the diffusion might be carried further than it was found possible to do in the preceding experiments. For this purpose he obtained a good, well-scaled, neutral, and perfectly soluble sample of ammonio-citrate of iron, containing only 25·92 per cent. of Fe_2O_3 . 10 per cent. and 5 per cent. solutions of this salt were submitted to dialysis, in the way already described, and the results obtained are given in the following tabulated statements :—

(2 *c*.)—10 per cent. Solution.

Days.	Amount of Salt Diffused.	Percent. of Salt Diffused.	Percent. Fe_2O_3 in Dried Diffusate.
2	92·23 grs.	46·10	21·56
2	30·62 „	15·31	32·23
3	23·37 „	11·68	33·13
3	8·16 „	4·08	35·50
3	2·27 „	1·13	37·40
4	·55 „	·27	39·43

At the end of twenty-eight days, diffusion having stopped, the salt still left in the dialyser was found to contain 61·26 per cent. of Fe_2O_3 .

(2 c.)—5 per cent. Solution.

Days.	Amount of Salt Diffused.	Percent. of Salt Diffused.	Percent. of Fe_2O_3 in Dried Diffusate.
2	66.65	33.32	25.07
2	25.73	12.86	30.12
3	17.91	8.95	32.44
3	6.4	3.2	35.88
3	2.47	1.23	36.01
4	1.64	.82	38.94
6	1.14	.57	40.01

At the end of twenty-eight days, diffusion having stopped, the salt in the dialyser was found to contain 68.54 per cent. of Fe_2O_3 .

The diffusive properties of potassio-tartrate of iron were next investigated. The samples, 3 a and 3 b contained 31.09 and 36.25 per cent. of Fe_2O_3 respectively, and were both used in pure aqueous solution. 3 c was the same sample as 3 b, but was used in solution rendered alkaline by potash. The principal results of these three experiments are shown in the following:—

Ten per cent. Solutions (200 grains of Potassio-tartrate of Iron in 2000 grains of Solution) Dialysed for Six Days.

	Amount of Salt Diffused.	Percent. of Salt Diffused.	Percent. of Fe_2O_3 in Diffusate.	Diffusion on the Sixth day.	Percent. of Fe_2O_3 in Salt not Diffused.
(3 a)	120.0	60.0	24.9	not ended	65.36
(3 b)	75.33	37.66	8.2	not ended	62.70
(3 c)	113.53	56.76	11.8	not ended	60.30

It thus appears that the potassio-tartrate of iron is a less diffusible salt than the ammonio-citrate, and this especially applies to the iron as a constituent of the salts. It also appears on comparing the results of experiments (3 a) and (3 b), that the salt containing the larger proportion of oxide of iron diffuses more slowly than the other, and that the diffusate contains a smaller proportion of iron. Citrate of iron and quinine was next experimented with, and proved to be a freely diffusible preparation.

The fifth, sixth, seventh, and eighth series of experiments recorded in the author's paper, illustrate the diffusive powers of the ferrous sulphate, ferric sulphate; ferrous chloride, and ferric chloride. Briefly summarizing the results, and comparing them with those of the previous experiments, it may be stated that while

the sulphates and chlorides, and especially the latter, stand pre-eminent in regard to the extent and rapidity with which they undergo liquid diffusion through a membrane, it cannot be said, in a medical sense, that the medical preparations, and especially those made with citric acid, are deficient in diffusibility; for the latter being given in much larger doses than the former, would be absorbed into the system to fully an equal extent.

A final number of experiments—the most instructive of the series—were made with dialysed iron itself. The sample used contained 5.28 per cent. of ferric oxide, and .23 per cent. of chlorine. The iron was completely precipitated by adding to the sample twenty times its volume of water of the London water supply. The precipitate thus obtained was washed on a filter with distilled water, and then digested with water to which hydrochloric acid of known strength was gradually added until the whole of the precipitate was apparently dissolved. It was found that 1.44 grains of HCl were thus required for 5.28 grains of Fe_2O_3 . This solution was put in a dialyser, but at the end of two days not a trace of iron had passed through the septum. The result was the same when twice the amount of hydrochloric acid was used in the same manner. Even when the proportion of acid was increased to the full quantity required for converting the whole of the ferric oxide present into ferric chloride, only a trace of iron could be found in the dialysate after two days. A dilute solution of albumen with hydrochloric acid was next digested for two hours with dialysed iron at 100°F ., and then left in a dialyser for two days, but no iron was found in the outer liquid. Finally, a peptone was prepared by dissolving 50 grains of coagulated albumen with 2 grains of pepsin in 500 grains of 1 per cent. dilute hydrochloric acid, adding 50 grains of dialysed iron, and digesting them together for two hours at 100°F . This was put into a dialyser for two days, but here again not a trace of iron was found in the diffusate.

In view of these results, the author expresses his grave doubts respecting the value of dialysed iron as a remedial agent.

Dialysed Iron. Dr. W. Inglis Clark. (Paper read before the North British Branch of the Pharmaceutical Society, March 10th, 1880, and printed in the *Pharm. Journ.*, 3rd series, x., 779.) The first part of this elaborate paper deals with the manufacture of dialysed iron, and will be found by those engaged in the preparation of this substance to be a valuable addition to the already very copious literature of the subject. The second part deals with the merits of dialysed iron as a therapeutic agent, so far as this

can be done by means of chemico-physical research; and it is this portion of the paper which, in the face of the adverse opinions expressed by M. Personne and Prof. Redwood (see the two previous articles), will undoubtedly prove of special interest to our readers. We therefore give a full account of the author's experiments bearing on this point:—

When the oxide of iron precipitated from dialysed iron is treated with strong hydrochloric acid in successive drops, there results—

a. A dark red solution.

b. A precipitate, redissolving, on standing, to a clear liquid, turbid by reflected light, and increasing in turbidity as more acid is added, till a point is reached.

c. When a precipitate falls (*d*), and a clear, bright yellow liquid (*e*) remains. Large excess of hydrochloric dissolves up the precipitate (*d*) by the aid of heat, and it is also soluble in cold distilled water. If these successive liquids be placed in dialysers, *a* will diffuse a notable amount of iron, the proportion varying with the amount of acid that has been added; *b* being the same liquid as *a*, with excess of acid, much iron was always found to pass through, even in a few minutes. The precipitate falls, especially on heating, before sufficient hydrochloric has been added to convert the iron into Fe_2Cl_6 . If the filtrate (*e*) from the precipitate be dialysed, nearly the whole of the iron diffuses through.

It would thus seem that a soluble oxychloride at first results, which by further addition of acid becomes decomposed, with an insoluble oxychloride and ferric chloride. The precipitate from ferric chloride by ammonia on addition of hydrochloric acid at first gives a non-diffusive dark red solution, but it undergoes no further decomposition on addition of acid; showing that some difference actually occurs in the two oxides.

These experiments were all made with strong or but slightly diluted hydrochloric acid, and they were performed before the appearance of Prof. Redwood's paper on the subject, so that the results therein described appeared irreconcilable with those above recorded. In order to imitate the precipitation of dialysed iron in the stomach, the author prepared mixtures containing dialysed iron, sodium chloride, etc., and on treatment with hydrochloric acid he invariably got diffusive iron. In some experiments no heat was used at all, while in others the liquid was boiled, with the result above mentioned. In order to see the effect of adding hydrochloric acid to dialysed iron, 5 c.c. of liq. ferri perchlor. f. were precipitated with ammonia, the precipitate was washed, and dissolved

in 5 c.c. of the same liquor. Complete dialysis showed a loss of 26.3 per cent. of iron. To the contents of the dialyser were now added 10 c.c. of acid hydrochlor, B. P.; a slight momentary precipitation occurred, and on continuing dialysis, exactly 26.3 per cent. of iron passed through again. Allowing for the diminution in iron when the acid was added, 35.7 per cent. passed through on continuing dialysis. In this case the acid was 1.3 times what was requisite to produce Fe_2Cl_6 . It was thus seen that in the cold, if the acid be only mixed in the dialyser, a large amount of iron is rendered diffusible.

The author also took 50 c.c. Wyeth's dialysed iron, mixed it with 10 c.c. ac. hydrochlor, B.P., or slightly less than is requisite to change it into Fe_2Cl_6 , boiled for one minute, and placed in a dialyser. He noticed the separation of insoluble basic chloride, previously described, and in twenty-four hours found the oxide of iron which had diffused to weigh 1.815 gram. If the dialysed iron contained 5 per cent. oxide of iron, the percentage which diffused was thus over 72 per cent. Two explanations of the difference in the author's results with those of Professor Redwood suggest themselves.

1. The author found that the more completely a sample of dialysed iron had been dialysed, the more difficult was it to form a diffusible compound without using excess of acid. He had prepared samples, stopping the operation while traces of chlorine could still be directly tested for in the liquor, or as soon as such direct testing indicated no chlorine, and by comparing these with very colloid forms, he found that in the former cases the action of hydrochloric acid was much more rapid and complete than in the latter, the solution of the precipitate taking place without the deposition of a basic precipitate. This would indicate that the advantages of dialysed iron would be most found in those samples which approached most nearly to an ordinary oxychloride, and yet were free from astringent properties.

2. He found that dilution of dialysed iron materially modified the action of hydrochloric acid on it, and at first noting the decomposition at the boiling point, he observed that the precipitation of the basic chloride with accompanying formation of diffusible chloride occurred at the following points of dilution :—

Wyeth's Iron	+	Ac. Hydrochlor. B.P.	+	Water.
1. 5 c.c.	+	0.55 c.c.	+	25 c.c.
2. 5 c.c.	+	1.00 c.c.	+	50 c.c.
3. 5 c.c.	+	2.05 c.c.	+	100 c.c.
4. 5 c.c.	+	5.0 c.c.	+	235 c.c.
5. 5 c.c.	+	1.0 c.c.	+	80 c.c. = no precip.

From this we see that 55 c.c., containing about half the amount of acid required to form Fe_2Cl_6 , with the iron was able to produce a diffusible chloride when diluted to 25 c.c., while 5 c.c. were needed to accomplish the same when dilution was carried to 240 c.c. This shows that 76 per cent. of HCl is necessary to form the diffusible chloride and basic precipitate at the boiling point, whatever be the relation of acid to the dialysed iron present. In the cold the same order of decomposition is found, and the same amount of acid will suffice if time be allowed.

The author has also made the following experiments:—

(a) 5 c.c. Wyeth's dialysed iron were diluted with distilled water to 40 c.c.; 10 c.c. hydrochloric acid, one-tenth of B.P. strength, were now run in, making the whole 50 c.c.; the HCl = 762 per cent. This was boiled for two minutes, and after two days' dialysis 086 gram Fe_2O_3 = 34.4 per cent. had diffused.

In the following seven experiments the dialysed iron was mixed with the distilled water, and dilute hydrochloric acid run in. The mixture was immediately placed in a dialyser, and the distilled water into which diffusion took place was kept at 100°F . for two or three hours. After that the whole was allowed to cool, the water frequently changed, and after two or four days the iron estimated as Fe_2O_3 . The results are given in a tabular form for comparison:—

Wyeth's Iron, HCl B.P.			Water to.	Fe_2O_3 diffused.		Time.
		Per cent.		gram.	Per cent.	
b.	5 c.c.	1 c.c. = 762	50 c.c.	056	= 22.4	2 days.
c.	20 "	1 " = 381	100 "	0635	= 6.35	2 "
d.	10 "	1 " = 381	100 "	014	= 8.8	2 "
e.	20 "	1 " = 1905	200 "	0375	= 3.75	2 "
f.	10 "	1 " = 1905	200 "	026	= 5.2	2 "
g.	40 "	1 " = 0952	400 "	0335	= 1.67	4 "
h.	10 "	1 " = 0952	400 "	0235	= 4.7	4 "

Some very interesting facts are derivable from these results. In *a* and *b* we see that the action is much more complete at the boiling point than at a lower temperature. In *c* the hydrochloric acid present was only equivalent to the formation of Fe_2Cl_6 with half the iron, while in *d* it was sufficient for the whole of the iron.

In *c* 6.35 per cent. of iron diffused.

In *d* 8.8 " " "

So that by doubling the acid, 1.23 times as much iron was rendered

diffusible. In *e* and *f* the hydrochloric acid was also equivalent to 50 and 100 per cent. of the iron.

In *e* 3.75 per cent. of iron diffused.

In *f* 5.2 " " "

So that by doubling the acid, 1.38 times as much iron diffused. In *g* and *h* the acid was equivalent to 25 and 100 per cent. of the iron.

In *g* 1.67 per cent. of iron diffused.

In *h* 4.7 " " "

By quadrupling the acid, 2.81 times as much iron diffused.

Now in *g* and *h* we have mixtures which contain a less percentage of HCl than is normally present in the stomach, and yet 1.67 per cent. and 4.7 per cent. of the iron were capable of diffusion, an amount which might easily account for the benefits said to be derived from the use of dialysed iron. It is instructive to note that with the same volume of dilute acid (0.952 per cent. HCl) a much higher percentage of iron is capable of absorption when the amount of dialysed iron present is small than when it is large. This points to the advantage of giving dialysed iron in small doses often repeated, under which circumstances the most favourable conditions for absorption are obtained. It will be noticed that the author assumed Wyeth's article to contain 5 per cent. of Fe_2O_3 . He has found the amount to range from 4.35 per cent. to 4.95 per cent., and if less than 5 per cent. were present the percentage of diffusible iron must be greater. Diffusion was not allowed to proceed to the fullest extent, but stopped after two or four days, and therefore the amounts given are actually less than what might be obtained. It may be urged that no substance would remain so long in the stomach, but the amount of absorbing surface must be far greater than that used in these experiments, while the quantity of substance to diffuse would be much less, so that the figures may be considered, at least approximately, indicative of what might occur in the stomach.

The dilution of the dialysed iron, coupled perhaps with the use, in Professor Redwood's case, of some very colloid preparation, may, in the author's opinion, account for all the differences which seem to exist between their results.

Even supposing, however, that the iron remains in a colloid, non-diffusing form, this would not, in the author's opinion, justify the conclusion that the iron cannot be assimilated, for in a similar manner it might be argued that gelatine and other colloids could

not be digested unless they were to pass through an intermediate crystalloid state.

In conclusion, the author thinks that the most reliable mode of ascertaining the therapeutic value of dialysed iron, would be by observing its effect upon the relative number of red blood corpuscles of patients under treatment.

Liquor Ferri Perchloridi and Liquor Ferri Persulphatis. F. L. Slocum. (*American Journal of Pharmacy*, February, 1880, 74.) The *Canadian Pharmaceutical Journal* for February, 1879, and the *American Journal of Pharmacy* for March, 1879, contained a process, by E. B. Shuttleworth, for the preparation of solution of perchloride of iron without the aid of heat, consisting in the gradual addition of the acidified solution of ferrous chloride to the requisite quantity of cold nitric acid.

At the request, and under the direction, of Prof. Maisch, the author carried out numerous experiments on this subject, with the following results:—

Liquor Ferri Perchloridi.—The acid solution of the ferrous chloride and the nitric acid had a temperature of 78° F., the temperature of the room; on slowly adding the acid ferrous chloride to the nitric acid, the temperature rose to 120° F. Oxidation was quite energetic, and nitrous fumes were given off constantly without foaming. When about two-thirds of the ferrous chloride was oxidized, the temperature had receded to 105° F., and oxidation was hardly perceptible, and when the whole of the ferrous chloride had been added, which required about fifteen minutes' time, the temperature of the solution had receded to 85° F. After standing awhile the solution acquired a colour similar to the official liquor, but owing to the great change of temperature it passed through in oxidizing, several nitrogen oxides were formed and remained, contaminating the solution; complete oxidation was not effected, and it is next to impossible to free the solution from nitrogen compounds.

After making numerous experiments, each time using a little higher temperature to begin with and a slight modification of the process, the following was found to be a very practicable process, and the lowest temperature that could be used to get at correct results:—

Mix the nitric and reserved hydrochloric acid in an evaporating or suitable basin, heat them to a temperature of 140° F., and filter into the mixed acids the solution of ferrous chloride previously heated to 150° F.; stir the solution while the liquids are mixing;

oxidation takes place gradually and completely, the temperature rising to 160° F. or 165° F. There is no accumulation and sudden expulsion of nitrous fumes causing foaming, as in the officinal process. The result is an acid solution of ferric chloride answering to the requirements of the Pharmacopœia.

Liquor Ferri Persulphatis.—A saturated aqueous solution of the ferrous sulphate was made, and to it the sulphuric acid was added; this solution was gradually added to the requisite quantity of nitric acid, both the acid solution of ferrous sulphate and the nitric acid being at 76° F.; on mixing, the solution acquired a temperature of 116° F., and only partial oxidation ensued, leaving a dense black liquid, which on standing two days acquired a colour similar to the officinal liquor, but contained both ferrous and ferric sulphate and nitric acid.

Several experiments were made, using each time an increase in temperature, until the following process was found to give a satisfactory result:—

Mix the nitric and sulphuric acids (using a slight excess of nitric acid), heat them to 140° F., make a hot saturated aqueous solution of ferrous sulphate (if necessary a few drops of sulphuric acid may be added), and when at a temperature of 180° F. or 190° F. filter it into the heated acids; oxidation takes place quietly and completely, the nitrous fumes being given off gradually from first to the close of the operation. After oxidation is completed, the solution should be kept at 140° F. for a few minutes, to remove all traces of nitrous fumes. The result is a solution of ferric sulphate, with a slight trace of nitric acid.

The particular advantage of these formulæ is that there is no accumulation of nitrous fumes, followed by their sudden expulsion at the end of the oxidation. But the oxidation and liberation of the nitrous fumes takes place at the same time, from the first gradually to the close of the operation; of course the low temperature required is also a marked advantage.

Albuminate of Iron. C. L. Diehl. (*Amer. Journ. of Pharm.*, April, 1880.) In an elaborate paper the author criticises the various methods in use for the preparation of albuminate of iron, and subsequently quotes a number of experiments leading up to a new method, which he regards as a decided improvement. The process is as follows:—

Four troy ounces of white of egg, diluted with sufficient distilled water to make up eight fluid ounces, are mixed with solution of fifty minims of liquor ferri chloridi, U.S.P., in four fluid ounces of

distilled water. The whole is filtered, then mixed with four fluid ounces of a saturated solution of common salt, and the precipitate thus formed collected on wetted muslin, washed with dilute solution of salt, drained, strongly expressed, and dried.

The following table shows the percentages of ferric oxide contained in a number of samples of albuminate of iron obtained by different processes :—

Albumen.	Ferric Oxide.	Corresponding to	
		Metallic Iron.	Ferric Chloride.
	p. c.	p. c.	p. c.
If $\text{Fe}_2\text{Cl}_3, \text{C}_{144}\text{H}_{122}\text{N}_{18}\text{S}_2\text{O}_{44}$.	4.500	3.147	9.150
If $\text{Fe}_2\text{O}_3, \text{C}_{144}\text{H}_{122}\text{N}_{18}\text{S}_2\text{O}_{44}$.	4.728	3.304	9.600
Friese's	3.998	2.800	8.122
Biel's	4.769	3.340	9.719
Hager's	6.500	4.550	13.201
Diehl's exp. 6	5.190	3.633	10.540
Friese's „ 7	4.800	3.360	9.748
Bernbeck's „ 8	4.800	3.360	9.748

The paper winds up with the following summary of conclusions :—

1. Albuminate of iron, in a dry condition, can be obtained with great ease by a method of precipitating its solutions with common salt.

2. So obtained, whether from solutions containing an excess of ferric chloride or an excess of albumen, it is constant in its composition as regards the relation of albumen to iron.

3. The dried and powdered product is easily dissolved by water.

4. Obtained by the method recommended, it contains a certain percentage of common salt; the presence of which, however, does not interfere with its solubility, nor with its therapeutic application.

5. The process recommended is rapid, and is conducted under conditions in which the albumen cannot be unfavourably affected by exposure to the heat of summer; and, even if exposed for a longer period than necessary, the presence of salt is calculated to prevent the changes to which albumen or its compounds, in a moist condition, are subject.

6. The albuminate represents about 5 per cent. of ferric oxide, or 10 per cent. of ferric chloride.

Extempore Preparation of various Quinine Salts. (*Zeitschr. des oesterr. Apoth. Ver., from Journ. de Pharm et de Chim., 1879, 453.*)

Quinine Carbolate.

℞	Quin. pur.	gr. x.
	Acid. carbol	gr. v.

Quinine Citrate.

℞	Quin. pur.	gr. xv.
	Acid. citric.	gr. viij.

The product corresponds to 20 grains of quinine citrate.

Quinine Hydrobromate.

℞	Quin. sulph.	ʒi. ʒij.
	Pot. bromid.	gr. xxviij.

The product corresponds to 100 grains of the hydrobromate.

Quinine Hydriodate.

℞	Quin. sulph.	gr. xcv.
	Pot. iodid.	gr. xl.

The product corresponds to 100 grains of the hydriodate.

Quinine Hypophosphite.

℞	Quin. hydrochlor.	ʒi. ʒij.
	Calc. hypophosph.	gr. xxiv.

The product corresponds to 100 grains of quinine hypophosphite.

Quinine Lactate.

℞	Quin. pur.	gr. lxx.
	Acid. lact.	gr. xxxv.

The mixture is triturated with a little alcohol. The product corresponds to 100 grains of quinine lactate.

Quinine Phosphate.

℞	Quin. sulph.	gr. xciv.
	Sodæ phosphat.	gr. lxxx.

The product corresponds to 100 grains of quinine phosphate.

The Preparation of Mercurial Ointment. E. Dietrich. (*Pharm. Centralk.*, 1880, 39.) The author has made numerous experiments as to the best mode of preparing this ointment, and arrives at the conclusion that it can be made with ease and rapidity without the use of old ointment or of additions of any kind. A very small quantity of the mercury should first be thoroughly incorporated

with the lard, and the bulk of the metal then added slowly and by degrees, first in small and gradually in larger portions.

Collier's suggestion of separating the mercury into minute particles by means of tincture of quillaia is considered by the author as impracticable, as the mercury again separates from the emulsion on mixing it with the fat.

Infusum Digitalis. Dr. C. Binz. (*Pharm. Zeitung*, 1879, 506.) The decomposition of infusion of digitalis, accompanied by the formation of mould, is attributed by the author to external conditions beyond the pharmacist's control. The same leaves sometimes yield an infusion which keeps well, and at other times one which soon gelatinizes. He has often noticed the formation of pectic acid in this infusion.

Sweet Spirit of Nitre. W. Smeeton. (*Pharm. Journ.*, 3rd series, x., 21.) The author's experience with the various processes for preparing sweet spirits of nitre leads him to give decided preference to the Edinburgh plan, as yielding a very satisfactory preparation. He recommends the following *modus operandi*:—

Three pints of nitric acid are carefully added in successive portions to twelve pints of alcohol. The mixture is placed in a still having a capacity of eight gallons, connected with a stone worm and Woulfe's bottles to catch what escapes the first condenser and receiver. Action will sometimes commence without artificial heat; if it does not steam is turned on till it does, but before the temperature reaches 140° distillation commences, rapidly at first, and requires very careful condensation. The distillate is in appearance and quantity about the same as that obtained by the B. P. process, but it is more ethereal and certainly more acid. It is now neutralized with milk of lime, and solution of chloride of calcium added. The nearly pure ether separates, floats on the surface, the liquid below containing the alcohol of distillate, and certainly most if not all the aldehyde, and possibly other products. The main difficulty of this process is caused by the volatile character of the ether, which renders the separation by a syphon a somewhat risky process, and, if inhaled, injuriously affects the health of the operator. After separation the ether is diluted with rectified spirit, in the requisite proportion. One ounce made up to a pint would yield a preparation containing 5 per cent. of nitrous ether, which, in the author's opinion is quite strong enough for medicinal purposes, and would be generally preferred to a preparation of greater strength.

Spiritus Ætheris Nitrosi: Its Composition and Analysis. F. M. Rimmington. (*Pharm. Journ.*, 3rd series, x., 41.) Two

analyses of a typical sample agreeing with the B. P. tests gave the following results:—

	No. 1.	No. 2.
Water	7.96	7.93
Aldehyde	1.19	1.19
Alcohol	88.10	88.10
Acetic Acid . . . . .	.47	.50
Nitrous Acid . . . . .	.59	.56
Nitrite of Ethyl	1.69	1.72
	100.00	100.00

Analyses of four commercial samples of spirit of nitrous ether, obtained from different sources and represented as the “best,” gave the following numbers:—

	No. 1.	No. 2.	No. 3.	No. 4.
Water	10.55	14.12	16.17	15.49
Aldehyde . . . . .	.75	.21	.24	.00
Alcohol	87.5	85.2	82.60	83.6
Acetic Acid . . . . .	.16	.03	.18	.16
Nitrous Acid . . . . .	.29	.27	.69	.68
Nitrite of Ethyl . . . . .	.75	.17	.10	.07
	100.00	100.00	100.00	100.00

The method of analysis recommended is as follows:—

Estimation of Nitrite of Ethyl.

5 c.c. of the spirit are added to 1 gram of pure potash (free from nitre) dissolved in 40 c.c. of pure water in a 50 c.c. graduated flask, stoppered and capped with leather; digest in a warm place at a temperature of 150–200° F. for three hours. Allow the flask to cool, and then dilute with water to 50 c.c.; shake and then take out with a pipette 10 c.c. of the liquid, and run it into a platinum dish, and add to it 40 c.c. of water; evaporate on a water-bath to 20 c.c., to get rid of the alcohol, etc. This residue is now to be washed into a flask of 16 ounces (or 450 c.c.) capacity, containing 10 grams of zinc foil coated with copper, and the volume of liquid made up to about 350 c.c. with water, and connected with a condenser; heat is now to be applied, and the distillation carried on as usual. Most

of the ammonia comes over in the first 100 c.c. of distillate, but it is necessary to distil another 50 c.c. to ensure perfect exhaustion. The ammonia thus obtained is now to be estimated with a standard sulphuric acid, 1 c.c. equal to .001 gram ammonia.

The amount of NH_3 found is to be multiplied by $100 + .824$, which will equal the total nitrogen in the spirit; and this, minus the nitrogen present in the free nitrous acid, when multiplied by 5.357 will give the nitrite of ethyl contained in the spirit.

Estimation of Nitrous and Acetic Acids.

The amounts of these two acids are necessary to be known in order to judge of the quality of the preparation, and for correctly estimating the nitrite of ethyl. 10 c.c. are to be measured with a pipette and run into a platinum dish, and diluted with an equal volume of pure water, and .5 gram carbonate of potash added, and stirred until dissolved; the solution is then evaporated on a water-bath to dryness. This saline residue is now to be treated with 5 c.c. of pure alcohol for the separation of the potassium acetate from the potassium nitrite, and again repeated, and the mixed solutions filtered through a very small Swedish filter; this filtrate evaporated in a tared capsule to dryness, and rapidly weighed. The weight minus .021 gram (the weight of $KN O_2$, which is dissolved by 10 c.c. of alcohol), and the amount multiplied by .6122, gives the quantity of acetic acid present in the spirit.

The amount of acetic acid thus found, multiplied by .7666 gives the equivalent of NO_2 to which it is equal, and this product deducted from the total acidity (previously determined alkali-metrically), leaves the net amount of NO_2 present.

Estimation of the Aldehyde.

Into a 25 or 50 c.c. flask run 10 c.c. of the spirit, and add 10 c.c. of peroxide of hydrogen, and let it stand two or three hours; by this time the aldehyde will have become converted into acetic acid, and may be estimated by decinormal alkali; the amount thus determined, less the number of c.c. required by the free acids previously determined, multiplied by .0044 will give the amount of aldehyde.

Estimation of Alcohol and Water.

The alcohol is estimated by the specific gravity, and the water by difference.

The foregoing scheme of analysis probably may look formidable in

the eyes of very practical people. It certainly involves some nicety of selection of materials, as to purity, but otherwise it is not difficult.

Examination of Spiritus Ætheris Nitrosi. Dr. A. Dupré. (From the *Analyst*, 1879.) Besides possessing the characters described in the B. P., this preparation should stand the following tests. It should give no precipitate with nitrate of silver; absence of hydrocyanic and formic acids. A small quantity poured on a little water, and ignited, should leave an aqueous solution which gives no precipitate with nitrate of silver; absence of hydrochloric ether, chloride of ethylene, etc.

The chloride of calcium test of the British Pharmacopœia is not of much value. Firstly, because only those samples respond to it which are nearly of the proper strength, and no information is gained as to the composition of those samples from which nothing separates, except of course that they are below the proper strength. Secondly, because the substance separating, though chiefly, is not by any means only, nitrous ether. The iron test may be used as a rough quantitative test by using a sample of known strength for comparison, and it offers a very ready means, before a magistrate for example, to show the character of any impugned sample.

Estimation of Nitrous Ether.—Ten cubic-centimetres of the ether are introduced into a small flask already containing about 1·5 gram of solid potash hydrate. The flask is closed with a well-fitting cork, gently agitated from time to time to promote solution of the potash, and left standing over night. Next day the contents of the flask, more or less yellow according to the amount of aldehyde present, are washed into an evaporating basin with 50 c.c. of water, and the mixture evaporated on a water-bath to about half or one-third. The remainder is allowed to cool, filtered through a little glass wool into a beaker, made up to 300 c.c. with water; 50 c.c. of diluted sulphuric acid (1 in 4) are added, and the nitrous acid present determined by a standard solution of permanganate. This standard solution is prepared by dissolving 8·475 grams of pure permanganate of potassium (or its equivalent) in 1 litre of water; 1 c.c. of this solution is equivalent to 0·01 gram of nitrous ether, and therefore indicates 0·1 per cent. of nitrous ether, if 10 c.c. of ether have been taken. The decoloration of the permanganate is rapid at first, gradually becoming slower. As soon as this is perceived, not more than 0·5 c.c. are added at a time, and the process must be considered as at an end if the solution still shows a distinct pink or red coloration two minutes after such addition. For every cubic-centimetre of permanganate solution then used,

the spiritus ætheris nitrosi contains, at a maximum, 0.1 per cent. of nitrous ether. The solution still continues to decolorize permanganate, though but slowly, and much more will have to be added before the coloration becomes permanent. The author has, however, convinced himself, by many experiments, that all nitrous acid present is oxidized when the above indicated point is reached. No doubt other substances are oxidized as well, and the process indicates more nitrous ether than is actually present; but as the error is on the side of leniency, it is perhaps an advantage rather than otherwise. By following out strictly the directions here given, it will be found that duplicate analyses of a sample rarely differ more than 0.1 per cent. from each other; while, with poor samples, the agreement is even more perfect. Should a sample require much permanganate, and the solution, instead of becoming colourless, remains brown or yellow, more sulphuric acid must be added.

If, instead of evaporating and filtering the alcoholic solution, it is at once diluted, acidified, and permanganate added, more of the latter will be required than in the former case. In good samples the difference is sometimes great, but in most poor samples it is but slight, and in such case this more rapid process may be adopted. The author has also tried the process of adding at once an excess of permanganate, letting stand five minutes and estimating the excess remaining, but the results given are decidedly too high. Various other methods have been proposed for the estimation of the nitrous ether, but he does not propose to enter into such, as the process given fulfils, he believes, all necessary conditions.

It is stated in most works on the subject that nitrous ether is rapidly decomposed, and becomes acid. The latter statement is correct, as far at least as ordinary spiritus ætheris nitrosi is concerned; but the former is not in accordance with the author's experience. Spiritus ætheris nitrosi becomes acid mainly on account of the oxidation of the aldehyde it contains, while the nitrous ether present suffers but slow decomposition, at least when dissolved in spirit of sufficient strength. A number of analyses are given in the original paper in support of this assertion.

Examination of Spiritus Ætheris Nitrosi. Dr. J. Muter. (*Analyst*, 1879.) The solutions used by the author are:—

1. Decinormal solution of hyposulphite of soda (sodium thiosulphate), made exactly according to the directions of the British Pharmacopœia, each c.c. of which equals .0127 free iodine.

2. Solution of potassium permanganate, containing 3.175 grams per litre, and checked to balance the "hypo." solution, by adding

excess of saturated solution of potassium iodide to 100 c.c., and then seeing that the iodine set free exactly requires 100 c.c. of "hypo." for complete decolorization, starch paste being added as an indicator towards the end of the process.

As the first step in the experiment, the specific gravity of the sample is taken at 60° F. 10 c.c. are digested with sufficient potassium hydrate in a small strong glass flask, closed by a cork, through which passes a bent delivery tube, dipping under a column of mercury in a test tube, of such a height as will enable the operator to heat gently on a water-bath under pressure without bursting the flask. This point is ascertained by a blank experiment, during which the flask is wrapped in a cover to prevent accident; and once arrived at, the same flask and mercury column are always employed. After digestion under pressure with frequent agitation for some time (an hour being usually ample), water is added, and the contents of the flask evaporated in a basin until no smell of spirit is perceptible. The residual liquid having been rendered *just neutral* with sulphuric acid, is filtered into a flask containing 75 c.c. of permanganate solution, previously diluted to 200 c.c. with water, and acidulated with 20 c.c. diluted sulphuric acid (1 in 3), and the flask having been corked is left for half an hour. At the end of that time excess of saturated solution of potassium iodide is added (which should produce a clear deep orange solution), and the whole brought under a burette containing the hyposulphite solution, and titrated. The number of c.c. of "hypo." used is deducted from the number of c.c. of permanganate put in, and the difference multiplied by .00375 gives the amount of ethyl nitrite in the 10 c.c. taken for analysis; and if this be multiplied by 100 and divided by 10 times the specific gravity of the original spirit, the answer will be the percentage of ethyl nitrite by weight. In working with spirits of unknown strength, it is advisable to put only 20 c.c. of the permanganate into the flask at first, diluted and acidulated as directed, and then if all the colour disappears under five minutes, to add 5 c.c. more at a time, until a permanent colour is obtained lasting five minutes, when the addition of another 5 c.c. will suffice before setting aside for the half hour. In a good spirit it is sufficient to take 5 c.c. for analysis, and to use 35 to 38 c.c. permanganate.

Analyses of six authentic samples, all of which were prepared in strict accordance with the Pharmacopœia directions, showed but a slight variation in the proportion of ethyl nitrite present, the lowest percentage being 2.85, and the highest 3.05.

It is advisable to perform a blank experiment, using 20 c.c. of rectified spirit, and the same weight of potassium hydrate, in the same manner as the ether, and to check it side by side with a sample experiment.

The Valuation of Tincture of Opium. Prof. A. B. Prescott. (From the *Proceedings of the American Pharmaceutical Association*.) The author examined twelve samples of tincture obtained from different sources, employing both Hager's and Staples' processes for the estimation of morphine in opium.

Hager's process, modified for the tincture and in other details, was conducted as follows:—The specific gravity of the tincture was taken, and a weighed quantity (from 25 to 30 grams) evaporated nearly to dryness on a water-bath; 1 gram of freshly slaked lime was added, with trituration, then 24 c.c. of distilled water added, and the mixture heated on a water-bath for one hour. The whole was then transferred to a small filter previously wetted, and the residue of the filtration washed with warm water until the filtrate dropped nearly colourless, and the filtrate evaporated on a water-bath to about 25 grams. The liquid was transferred, with rinsings, to a small wide-mouthed bottle, and while it was still warm 1 c.c. of ether and 3 drops of benzole were added with shaking, then 1.1 gram of ammonium chloride added and dissolved, and the mixture set aside for twenty-four hours. The liquid was then agitated, the crystals detached from the interior of the bottle, the whole brought upon a small filter, previously dried and weighed, the crystalline residue washed with about 8 c.c. of distilled water, dried at about 50° C. (122° F.), and weighed. Hager directed to leave the mixture three hours for separation of morphine. He has also advised to deduct one-tenth for impurities in the crude morphine of the process (the crystals not being washed with ether or chloroform). But the filtrate, about 25 grams, if holding only one-thousandth of its weight of morphine in solution, would carry about 0.025 of the alkaloid, fully as much as the one-tenth for foreign substances weighed with the morphine. Now when twenty-four hours are given for crystallization of morphine, there can scarcely be less than one part of morphine in 1000 parts of the filtrate. It is not likely, however, that one-tenth the weight of the crystals (not ether-washed) is as much as the impurities. It will be seen from the results given with Staples' process that the ether-washing alone removes a variable quantity, averaging not far from one-tenth the weight of the crystals, and ether-washing certainly does not leave absolute morphine. The author advises ether-washing of the crude

morphine in Hager's process for the tincture, and then leaving remaining impurities to balance the morphine remaining in the filtrate.

Staples' process was employed in the following manner:—The specific gravity of the tincture having been ascertained in the first place, 25 grams were evaporated to one-half their bulk on the water-bath, then set aside twenty-four hours for the tarry matters (soluble in alcohol but not in water) to subside, and decanted upon a filter, the filtrate being received in a small wide-mouthed bottle. The tarry residue was washed with 4 c.c. (about 1 fluid drachm) of water, and the washings filtered into the previously obtained filtrate. To the clear liquid in the bottle was added an equal bulk of alcohol of specific gravity 0.835, and then a mixture of 1.3 c.c. (20 minims) of solution of ammonia (sp. gr. 0.96), with 1.7 c.c. (25 minims) of alcohol. After agitation, the bottle was closed with a stopper and set aside for four days. The liquid was then agitated, the crystals detached from the side of the bottle, and the whole filtered upon a small filter previously dried and weighed. The last portion of crystals was rinsed from the bottle upon the filter with a little of the filtrate. The crystals were then washed with 4 c.c. (1 fluid drachm) of diluted alcohol, then with the same measure of distilled water, then dried at about 50° C. (120° F.), and weighed. The dried crystals were then washed with 8 c.c. (2 fluid drachms) of washed ether, dried at 50° C., and again weighed.

The directions in Staples' process are to leave twenty-four hours for crystallization of the morphine, and to add the ammonia in two portions, in both which particulars the process was departed from.

The process of Hager, it will be seen, takes less time than that of Staples; but the time depends greatly on the period given for formation of morphine crystals. By long standing a slightly greater yield is obtained.

The author concludes that Staples' process yields the best crystals of morphine, but considers that in other respects it is little if at all preferable to Hager's method.

Taraxacum. Dr. C. Symes. (From a paper read before the Pharmaceutical Society, and printed in the *Pharm. Journ.*, 3rd series, x., 361.) Referring to the well-known differences of opinion as to the best time of the year for collecting dandelion root, the author states that his own experience points to November as the month in which these roots should be gathered for medicinal use, the period being extended to the beginning of December if the winter has not commenced early; or in other words, the later they are gathered, so

long as they have not been subjected to the influence of frost, the better they will be. At this period, it is true, they contain a large quantity of inulin, but the active principle, or taraxacin, is more fully developed (if bitterness is any criterion) than at any other season, and the inulin can be separated from the expressed juice far more readily than the saccharine matter which abounds in the spring. He has examined samples of the fresh juice late in the autumn which had comparatively little action on Fehling's solution, whilst at other seasons it is very marked and energetic. No sooner does the frosty weather set in than the roots become sweet, the starchy matter becoming converted into saccharine; a necessary condition of things before it can serve the useful purpose in the economy of the plant for which it appears designed, viz., for the nourishment of the root during the cold weather. This is probably brought about under the influence of a ferment which operates specially at low temperature; but that starch, even in the absence of a ferment, and in the cold, may be gradually converted into dextrine, has recently been shown by Ribau (*Bull. Soc. Chim.*, xxxi., 10), and as regards the change in dandelion roots, no one who will take the trouble to examine them before and after a few sharp frosts will have the least doubt as to the increased sweetness. The author's first impression was that the bitter principle remained intact, and was merely masked by the presence of the saccharine matter, but experiment led him to the conclusion that it became more or less altered in character, and that its destruction went on *pari passu* with that of the inulin.

As to the preparations of taraxacum, the solid extract is not regarded by medical men as an agent of much activity, except in large doses; the succus, on the other hand, is much prescribed, not unfrequently in too small doses, but when well prepared and moderately fresh is a good representative of the medicinal properties of the drug. When, however, it is kept for any length of time, and more especially in warm weather, it often becomes turbid, deposits, and sometimes ferments, losing most of its bitterness, and this will, as a matter of course, occur much more readily in the presence of a large quantity of saccharine matter than in its comparative absence. Reasons which it will be unnecessary to detail render it undesirable to increase the quantity of alcohol in any medicinal preparation of the kind, beyond the amount necessary for its complete and perfect preservation, but especially in that under consideration, where the quantity administered is or should be comparatively large. But in the formula given a minimum of spirit is used at a

risk of the stability of the preparation, and the author, therefore, suggests an increase of about 5 per cent. of spirit. The dose as regards bulk might be diminished by concentrating the filtered juice as soon as possible after expression from the roots.

In conclusion, the author bears testimony to the value of the fluid extract of *taraxacum officinal* in the United States Pharmacopœia, which he regards as a strong, efficient, elegant, and stable preparation.

Experiments on Taraxacum Root. J. B. Barnes. (From a paper read before the Pharmaceutical Society, April 21st, 1880, and printed in the *Pharm. Journ.*, 3rd series, x., 849.)

Experiment No. 1.—In order to exclude inulin (which in the autumn is so very abundant and necessary to the development of the plant, gives considerable trouble, and causes much waste in preparing the succus, and is not completely separated from the extract), clean, fresh taraxacum root in thin slices, with the milky juice exuding, was covered with rectified spirit for two hours, strained and washed with more spirit, and the clear liquor evaporated over a water-bath to dryness, the result being a bright canary-coloured hygroscopic powder, possessing an intensely bitter taste and perfectly soluble in water.

Experiment No. 2.—The above preliminary operation being wasteful of spirit, one pound of clean, fresh, thinly-sliced root was macerated with an equal weight of spirits of wine for two days, the liquid poured off, the marc pressed and the product filtered, the spirit recovered by distillation, and the solution evaporated over a water-bath to the consistence of an extract, which is bitter and of a light brown colour. The quantity obtained was one ounce and a half.

Experiment No. 3.—The above operations were repeated, three pounds of another sample of fresh root being now employed; but the evaporation was continued to dryness and the product powdered, the result being a yellowish hygroscopic powder. It possesses a bitter taste, but not so intense as that obtained in Experiment No. 1, the pressure having extracted something, probably sugar and other matters, in addition. A small quantity of inulin was pressed out, which, however, was readily separated by filtration. The quantity of dry extract obtained was three ounces and a quarter.

Experiment No. 5.—Half a pound of dried taraxacum root, reduced to powder, was macerated for twelve hours in half a pound of rectified spirit, and percolated with a further portion of spirit.

After distilling off the spirit an oily-looking substance was observed floating upon the surface of the liquid. It was separated by filtration, and dissolved in ether; the latter having evaporated, there remained a semi-solid, tasteless, greenish, oily substance. The liquid extract upon further evaporation yielded a golden-coloured, bitter, solid extract, so very hygroscopic as to defy all efforts to reduce it to powder.

In all these experiments upon taraxacum root with spirit, albumen and inulin are necessarily separated; it is clear that No. 1 gives the best result, presuming bitterness and brilliancy to be the standard of efficiency.

Commercially, Nos. 2 and 3 show the most satisfactory results, the waste of spirit being reduced almost to nil, and the yield satisfactory.

No. 4 shows that cold water does not separate the bitter principle of taraxacum. These results all clearly point to the conclusion that an alcoholic extract of taraxacum root is superior to the extract of the Pharmacopœia.

A tincture made by percolating the dried root with rectified spirit, so as to obtain it of the strength of one in two, would, the author thinks, be an improvement on the preserved juice; it resembles tincture of nux vomica in colour, and has a very bitter taste.

When water is added to this tincture it becomes opaque, and after the addition of dilute hydrochloric acid, in a few hours a pale brown precipitate soluble in ether, chloroform, and petroleum spirit is formed, upon the evaporation of which there remains the greenish oily substance above described.

Pharmaceutical Preparations of Coca. G. W. Kennedy. (Abstracted from the *Proceedings of the American Pharmaceutical Association*.) The author recommends a fluid extract and an elixir prepared according to the following formula:—

Extractum Coca Fluidum.

Coca leaves in moderately fine powder	16 troy ounces.
Alcohol (95 per cent.)	12 fluid ..
Water	4

Moisten the powdered leaves with the above menstruum, pack it carefully into a conical percolator, cover the surface of the powder with a disk of paper, and add the remainder of the menstruum; when the liquid begins to drop from the percolator close the lower orifice with a cork, cover the percolator closely, so as to prevent evaporation, and allow it to remain in this condition forty-eight hours. The cork is then to be removed and percolation allowed to

proceed, dropping not faster than at the rate of forty drops per minute, as quick percolation will not furnish good results, and should be discountenanced, more especially in the manufacture of concentrated preparations. When the drug to be operated upon is small and the menstruum large, as in most of the tinctures, percolation can be allowed to proceed at the rate of sixty drops per minute with excellent results. The first twelve ounces of the percolate should be reserved, and percolation continued with the same menstruum until the drug is thoroughly exhausted; evaporate the last portion at a temperature not higher than 130° F., until reduced to four fluid ounces, and mix this with the reserved portion. The fluid extract prepared in accordance with this formula will be found of a dark greenish brown colour, and to contain in the highest degree the odour and taste characteristic of the drug.

Elixir Coca.

Coca leaves in moderately fine powder	℥iv.
Alcohol and water	āā q.s.
Oil of Orange	gtt. vj.
Oil of Cinnamon	gtt. ij.
Syrup	℥iv.

Mix three measures of alcohol with one of water, moisten the powder with two fluid ounces of the mixture, pack it firmly in a conical percolator, and gradually pour on a sufficient quantity of the menstruum until eleven and a half fluid ounces of percolate are obtained. Dissolve the oils in half an ounce of alcohol, add to the percolate, and finally the syrup. This will furnish a very elegant elixir, and each fluid drachm will represent the active constituents of fifteen grains of the drug when carefully prepared.

Pharmaceutical Extracts. Dr. E. Schmidt. (*Répertoire de Pharmacie*, vii., 249.) In a long and elaborate paper, the author deals critically with the preparation, classification, general characters, and uses of pharmaceutical extracts. The paper not being suited for abstraction, we must here confine ourselves to this notice, and refer the reader to the original article, or to its translation in the *Pharmaceutical Journal*, August 2nd, 1879, 84-86, and August 16th, 124, 125.

Experiments on the Comparative Value of some Extracts of Narcotic Plants. H. Bretet. (*Répert. de Pharm.*, 1879, 537, and *Pharm. Journ.*, 3rd series, x., 565.) The author carried out a number of experiments with the object of determining the relative medicinal value of narcotic extracts prepared by different processes.

He first operated upon conium. 10 kilograms of leaves yielded 210 grams of extract of defecated juice. He exhausted the residue from this operation with boiling water, by means of two successive infusions, and obtained thus 500 grams of solid extract. The conia was estimated in 10 grams of each of these extracts. The extract was dissolved in 30 grams of distilled water, and 2 grams of bicarbonate of soda were added to the solution. When the reaction had terminated the liquid was shaken with 100 c.c. of rectified ether every ten minutes during two hours; the ethereal liquid was then separated and the agitation was repeated with a fresh quantity of ether. The united ethereal liquids were shaken with 60 grams of water acidulated with sulphuric acid, during half an hour, after which the acid liquid was treated with Mayer's reagent (iodide of mercury and potassium) in considerable excess. After twenty-four hours of contact at a temperature of about 30° C., the liquid was filtered, the residue dissolved in 93 per cent. alcohol, and this solution evaporated in a previously weighed capsule,—first in a water-bath, and then in a stove at 100° C.,—until the weight was constant.

The residue left by the extract of the defecated juice weighed 0.074 gram.

The residue of the infusion extract weighed 0.105 gram.

The double iodide of mercury and conicine contains 17.69 per cent. of alkaloid. It results from the foregoing experiment that—

10 gr. of extract prepared from defecated juice of conium contained 0.01309 gr. of conicine; and—

10 gr. of extract prepared by infusion from the same plant, after being deprived of juice, contained 0.01857 gr. of conicine.

In another comparative experiment made with an extract prepared from the juice and one prepared by direct infusion of the fresh plant,—

10 gr. of extract from juice contained 0.0159 gr. of conicine.

10 gr. of aqueous extract contained 0.0329 gr. of conicine.

These figures—which, while differing considerably from the former, show results tending in the same direction—were obtained by the same process.

This process is imperfect in itself when applied to conium, because the salt of conicine is rather soluble in water; therefore the preceding figures are given only as terms of comparison, and as such they have their value, because the manipulation was the same in the smallest details in all the operations.

For plants containing fixed alkaloids,—belladonna and datura,—the author completely modified the analytical method. 10 grams

of extract are dissolved in 15 grams of water, and 2 grams of bicarbonate of soda added to the solution. When the evolution of gas has terminated the liquid is mixed with 10 grams of well-washed wood sawdust, and dried completely in a water-bath; the powder is then introduced still warm into a displacement apparatus, and chloroform poured upon it. After twelve hours' contact, the lixiviation is continued with 250 grams of chloroform, and the last portions driven through with water. The chloroform solution is received in a flask containing a titrated solution of sulphuric acid corresponding to a determined volume of an alkaline solution. The chloroform being distilled, the cooled acid liquor is thrown upon a small moistened filter, the flask and the filter being rinsed with water until the united liquids measure 60 c.c. A solution of alkaloids is thus obtained, in which the acid in excess is neutralized by a titrated solution of potash, the volume used giving, by difference, the quantity of alkaloid.

When operating upon alcoholic extracts, it is necessary to modify this process still further, otherwise it gives figures much above the reality and differing among themselves for the same extract. In estimating these extracts, the author does not distil off the chloroform, but agitates in the cold with the acid solution, which is afterwards separated by means of a separating funnel. The chloroform, retaining the chlorophyll, is again shaken with distilled water, which is afterwards added to the first solution. The titration is then made as in the other extracts.

Having analysed by this method a certain number of extracts of belladonna and datura from various sources, the following experiments were made :—

Two stalks of belladonna yielded 1,550 grams of stripped leaves these were divided into two equal parts, one of which was dried and yielded 122 grams of extremely dry leaves.

The 775 grams of fresh leaves were bruised and the juice was removed by strong pressure and clarified in the ordinary manner. The coagulum (A) produced by the clarification of the juice was collected carefully. While moist it weighed 20 grams; after drying in a stove its weight remained at 4 grams. It was put aside for the estimation of the atropine.

The clarified juice gave 23 grams of extract of pilular consistence (B).

The leaves from which the juice had been removed were exhausted with boiling water and gave 12 grams of very firm extract (C).

The dried leaves were pounded and gave 104 grams of semi-fine powder. 52 grams of this powder, exhausted with boiling water, yielded 18 grams of aqueous extract (D). 52 grams, exhausted with 60 per cent. alcohol yielded 16 grams of alcoholic extract (E.)

The four extracts were titrated by the process just described. As to the coagulum, 2 grams of bicarbonate of soda were dissolved in 10 grams of water, the coagulum was suspended in this liquid, and then the whole was dried in a water-bath. The powder resulting from this operation was introduced into a displacement apparatus, and treated similarly to the extracts.

The alkaline solution employed to saturate the acid contained 1.75 gram of pure and perfectly dry potash per 100 c.c.; consequently each tenth of a cubic centimetre represented 0.00175 gram of potash. The equivalent of this base being 56.11, and that of atropine 289, each division of the alkaline liquor corresponded to 0.00175×289

$$\frac{56.11}{56.11} = 0.009013 \text{ of atropine or daturine, the elementary composition of these alkaloids being the same.}$$

10 c.c. of acid liquor—that is to say, the quantity employed for each operation—were neutralized by ninety divisions of the alkaline liquid.

The liquid from the coagulum (A) required only eighty-five divisions.

The liquid from the extract of the juice (B) required only eighty-six divisions.

The liquid from the extract (C) required only eighty-two divisions.

The liquid from the aqueous extract (D) required only eighty-two divisions.

The liquid from the alcoholic extract (E) required only seventy-five divisions.

From which it results that—

	Atropine, grams.
The coagulum (A)	contained $0.009013 \times 5 = 0.0450$.
10 gr. of extract (B) (de- fecated juice)	„ $0.009013 \times 4 = 0.0365$.
10 gr. of extract (C) (leaves deprived of juice)	„ $0.009013 \times 8 = 0.0721$.
10 gr. of extract (D) (aqueous extract)	„ $0.009013 \times 8 = 0.0721$.
10 gr. of extract (E) (al- coholic extract)	„ $0.009013 \times 15 = 0.1352$.

From a general review of these experiments the following facts are deducible :—

1 kilogram of fresh leaves deposited upon clarification of the juice 5.16 gr. of albuminous coagulum, containing 0.0580 gr. of atropine.

1 kilogram of fresh leaves yielded 29.60 gr. of juice extract, containing 0.305 per cent., or 0.1067 gr. of atropine.

1 kilogram of fresh leaves deprived of juice yielded 15.50 gr. of aqueous extract, containing 0.721 per cent., or 0.1117 gr. of atropine.

1 kilogram of fresh leaves weighed 157 grams when dried, and yielded 54.94 grams of aqueous extract, containing 0.721 per cent., or 0.3961 gr. of atropine.

1 kilogram of fresh leaves weighed 157 grams when dried, and yielded 48.54 gr. of alcoholic extract, containing 1.352 per cent., or 0.6562 gr. of atropine.

The following are the results of the titration of some other extracts from various sources :—

Alcoholic extract of datura, made in the author's establishment in 1877 : contained 1.442 per cent. of alkaloid.

Alcoholic extract of belladonna of commerce, two samples : contained 1.081 and 1.400 per cent. of alkaloid.

Extract of defecated juice of belladonna of commerce, two specimens : contained 0.030 and 0.270 per cent. of alkaloid.

Aqueous extract of datura, made in the author's establishment in 1879 : contained 0.451 per cent. of alkaloid.

Aqueous extract of belladonna of commerce, three specimens : contained respectively 0.721 per cent., 0.180 per cent., and no alkaloid.

All the author's experiments show the decided superiority of the alcoholic extract, and next to it comes the extract by infusion, which, notwithstanding the abundance of inert matters in it, always contains proportionally more alkaloid than the extract of the juice. It follows, also, from the experiments upon fresh belladonna, that the extract of the non-defecated juice, which formerly was always employed, contains more alkaloid than the extract of defecated juice, since the albuminous coagulum always contains a small quantity. Thus, in the present case, a kilogram of fresh belladonna leaves yielded $29.60 + 5.16 = 34.76$ grams of extract with fecula, containing 0.1647 gram of atropine, or 0.473 per cent. in the place of 0.305 per cent. which the Codex extract contains. This confirms the opinion of some of the older pharmacologists, who considered

the extracts of Storck to be more active than the extracts of defecated juice.

Improvements in preparing Extracts of Malt. O. F. Romer and H. R. Randoll. (*New Remedies*, June, 1880.) The authors have effected several improvements in the process of making extract of malt, viz.: 1. The properly ground malt is treated with an alkaline solution, in order to neutralize the fatty acids, which usually impart a bad taste to the product. 2. The extract is separated from the solid matters by pressing, in press-cloths, whereby it is obtained as a clear liquid, with scarcely any loss.

Extract of Walnut Leaves. C. Govaerts. (*Répert. de Pharm.*, vii., 145. From *Pharm. Journ.*) Preparations of the walnut (*Juglans regia*, L.), after having enjoyed in France the popularity often gained by recently introduced medicines, are not much now employed. Experience has demonstrated, however, that the walnut may be classed among the plants most useful in medicine. The author quotes various authorities who speak highly of its anti-scrofulous properties.

The Belgian Codex includes an extract of the dry leaves, and the extract enters into the composition of the "Sirop de Vanier," a preparation largely used. The author's experiments have been directed to ascertaining whether this extract represents the maximum of the active principles contained in the leaves, and what are the conditions that may influence the quantity of these principles in the leaves and in the extract.

The leaves of the walnut contain principally chlorophyll, tannin, a volatile aromatic principle, and an acrid bitter matter (juglandin), found more specially in the green husk and the epiderm of the seed. Distilled in the fresh state, the leaves yield a rather aromatic, limpid water, neutral to litmus paper.

The fresh juice is green, but upon being heated it abandons its chlorophyll, and at the same time becomes sensibly darker in colour.

In drying the leaves lose 50 to 55 per cent. of their weight, but without sensibly altering in colour or taste. The petioles only turn brown.

These leaves cannot be collected according to the general rule, *i.e.*, at the commencement of the flowering,—for at that time they have scarcely issued from the buds, and are far from possessing the desired properties.

If walnut leaves, collected at the proper time and recently dried, be compared with those met with in commerce, the difference in the

characters is striking. After some months, in fact, the dried leaves, exposed to the open air, turn brown, and at the same time lose their aromatic odour and bitterness. This physical change, produced under the influence of moisture and air, is the index of a chemical transformation that takes place after the drying. The prolonged action of air and moisture gradually converts the juglandin into an insoluble and insipid black substance, and the tannin becomes partially insoluble or decomposed.

Experiments were made with preparations from (1) leaves collected in June; (2) leaves collected in October; (3) leaves collected at the proper time, but which had been kept one year. Tannin being one of the most active principles of the leaves, this was estimated as indicative to a certain extent of the value of the respective preparations. The method adopted was that of Löwenthal, based upon the oxidation of the tannin by permanganate of potash in the presence of indigo carmine. A gram of each extract and 20 c.c. of each solution were submitted to the action of the permanganate.

1. An extract prepared from the juice of leaves collected in June, clarified by heat and evaporated. Taste: bitter and astringent. Odour: aromatic. Solution: limpid. Tannin in 1 gram of extract: 0.19 gr.

2. Similar leaves were submitted to distillation, and the residue filtered and evaporated to an extract. Taste: slightly bitter. Odour: very slight. Solution: turbid. Tannin in 1 gram: 0.19 gr.

3. The remainder of the June leaves were dried in the open air, and an extract prepared from them according to the Belgian Pharmacopœia. Taste: bitter and astringent. Odour: aromatic. Solution: limpid. Tannin in 1 gram: 0.20 gr.

4. Leaves collected in October were dried directly and converted into extract. Product resembled (3) in every respect.

5. Extract prepared from leaves one year old. Taste: slightly astringent and slightly bitter. Odour: none. Solution: very dark. Tannin in 1 gram: 0.10 gr.

6. Extract of commerce. Similar to (5) with the exception of solution being limpid.

It appears, therefore, that the full-grown leaves may be collected at any period during the fine weather, even as late as October, when they can be removed without injuring the tree. The extract of walnut, in order to represent the active principles as completely as possible, should be prepared with such leaves recently dried. The extract prepared from the defecated juice is as rich in tannin,

but does not keep so well; whilst that prepared by decoction should be rejected. The leaves falling in autumn should not be used, although there is reason to believe that they are often employed in preparing the extract of commerce.

Walnut leaves of good quality are of a fine green colour on their upper surface, and of a darker green underneath, with brown petioles. They have a parchment-like texture, an aromatic odour, and a freely bitter and astringent taste. Altered leaves lose the greater part of their odour and bitterness, and turn a dirty green colour, approaching brown. Fallen autumn leaves sometimes have yellow spots on their surface.

Liquid Extract of Ergot for Hypodermic Injection. P. Yvon. (*Revue Méd.*, Nov. 15th, 1879.) The aqueous extract of ergot, commonly known by the name of ergotine, is not suited for subcutaneous injections, as it forms a muddy solution which cannot be cleared by filtration without the loss of a considerable portion of its active constituents. The author prepares a fluid extract for hypodermic use by the following process:—

The coarsely powdered ergot is freed from oil by repeated extraction with bisulphide of carbon, and then exposed to the air in a dark place until it is dry and free from the odour of the solvent. It is now exhausted by percolation with cold water containing 0·4 per cent. of tartaric acid, the percolate freed from albuminous matter by heat, the filtrate reduced to one-third of its bulk by evaporation on a water-bath, the residue neutralized with an excess of freshly precipitated calcium carbonate, next evaporated to the consistence of a syrup, and this mixed with strong alcohol. The filtered mixture is decolorized with pure animal charcoal, again filtered, and the alcohol removed from it by evaporation. The residue is dissolved in a quantity of water sufficient to make the weight of the solution equal to that of the ergot employed. For every 100 grams of ergot used, 0·15 gram of salicylic acid is dissolved in this liquid, which is then allowed to stand in a cool place for several days, decanted from any deposit formed during the time, and preserved in small bottles.

This preparation is a clear amber-coloured liquid, which keeps well, and contains the active constituents of an equal weight of ergot. It is injected in quantities of one gram.

Commercial Extract of Krameria. J. W. Hoffa. (*Amer. Journ. of Pharm.*, 1880, 296.) The author has examined a number of trade specimens of this extract, and obtained results showing considerable differences in the composition of the samples, and

proving that the directions of the Pharmacopœia are often ignored by the makers.

The following table shows the amounts of soluble matter and tannin in the samples examined :—

100 grains *Commercial Extract of Krameria* contain :

	Number of grs. Insoluble Matter in Cold Distilled Water.	Number of grs. Insoluble Matter in Hot Distilled Water.	Amount of Tannin, grs.
A	24	21½	18½
B	43	37	16½
C	59½	53	10½
D	67½	63	8
E	76½	71½	7
F	81	74½	6½
G	88	84½	5½
H	86	81½	4½

The official process for preparing this extract yields a more astringent and much more soluble extract.

After experimenting with hot and cold water, alcohol, and a mixture of alcohol, water, and glycerin, the most satisfactory results were obtained by the following formula :—

℞ Krameria, in moderately fine powder . 16 troy ozs.
Glycerin ½ “
Distilled Water a sufficient quantity.

Moisten the powder with 5 fluid ounces of the distilled water, previously mixed with the glycerin. Pack it firmly in a conical glass percolator, and allow it to macerate for forty-eight hours; then gradually pour distilled water upon it until the drug is exhausted; then evaporate the percolate by means of a water-bath, at a temperature between 150° and 170° F., to the consistency of an extract.

The extract, weighing 9 per cent. of the powdered root, is completely soluble in cold and hot water, and indicates 31 per cent. of tannin.

The Purity of Chloroform. J. Regnault. (*Journ. de Pharm.* [4], xxix., 402-405.) The author points out the importance of ascertaining the purity of chloroform intended for anæsthetical purposes, and recommends the following simple tests for this purpose.

Dropped on paper and allowed to evaporate, the sample ought to leave the paper perfectly dry and free from any disagreeable irritating odour.

The sample ought not to redden blue litmus paper, or give the slightest cloudiness with silver nitrate. If it should do either, it contains hydrochloric acid or the products of decomposition of some other chlorides.

It should remain perfectly colourless when boiled with potash; the presence of aldehyde causes a brown coloration.

When shaken with concentrated sulphuric acid and allowed to stand for half an hour, the two liquids should separate into two colourless layers. The presence of alcoholic chlorides produces a brown coloration.

The purity of chloroform may be judged by its constant boiling point, 60.8° . Impure chloroform may boil above or below, according to the impurities it contains.

The sp. gr. of chloroform can hardly be used as a criterion of its purity, since its determination has been attended with conflicting results. Liebig has found the sp. gr. of pure chloroform to be 1.48 at 18° . Suberain (*Ibid.* [3], xvi., 5) shows that this number is too low, the sp. gr. at 12° being 1.496. Again, Remys (*Archiv Pharm.* [3], v., 31) points out that the sp. gr. of pure chloroform is 1.5 at 15° , and, moreover the presence of $\frac{1}{500}$ of alcohol lowers the sp. gr. .002.

The purity of chloroform may to a certain extent be judged by the complete insolubility of Hoffman's violet in it: if it contains a trace of alcohol, the solution is coloured a beautiful purple.

The Testing of Pepsin. A. Petit. (*Journ. de Pharm. et de Chim.* [5], i., 82.) After reviewing the various methods of testing pepsin, namely, (1) by coagulation; (2) by coagulated white of egg; (3) by fibrin, the author concludes that the first method should be rejected, since the principle in rennet which coagulates milk differs from that which dissolves and transforms fibrin.

The second method, which is generally adopted, has one objection, that it does not establish sufficient gradation in the transformation; it may, however, be used as follows:—An egg is boiled for half an hour, the white passes through a sieve, and 5 grams of the coagulated albumen are treated with 25 grams of hydrochloric acid (1.5 HCl per litre) at 40° . The albumen should be dissolved in four or five hours by 0.10 gram pepsin. The mixture should be shaken every half hour.

The third method is the most suitable. All the phenomena are distinct and comparable; whatever be the nature of the ferment, all things being equal, its exact equivalence may be determined by reference to other specimens:—5 grains of moist fibrin strongly

dried are treated with 25 c.c. of hydrochloric acid (3 grams HCl per litre), and to several flasks thus prepared, quantities of pepsin, varying from 0.10 to 0.60 gram, are added and heated to 50°, at which temperature the action of pepsin is at a maximum. Agitate every half hour until dissolved, and then every hour: no precipitate should be produced by nitric acid after six hours heating with 0.5-0.6 gram pepsin.

Marshmallow Root as an Excipient for Pill Masses. W. W. Beitenman. (*Amer. Journ. of Pharm.*, October, 1879.) The author's experiments confirm the great value of powdered marshmallow root as a pill excipient, especially when used in combination with tragacanth and sugar. He suggests the following as the most suitable form of combination:—

R Powd. Althæa 5j.
 „ Tragacanth grs. x.
 Simple Syrup f 5ij.
 Mix well.

This is easily and quickly prepared, is ropy, plastic, and of such adhesiveness that even with heavy mineral substances, such as dried sulphate of iron or reduced iron, a small quantity will give a mass capable of being easily and thinly rolled out.

The author subjoins a list of some substances made into pills, stating opposite each the amount of excipient required to form a mass:—

	Grs.	Excip., grs.	No. of Pills.
Pyrophosphate of Iron	45	5	15
Dried Sulphate „	30	3	15
Quevenne's Iron	30	4	15
Sulphate of Quinine	20	2	20
„ Cinchonidine	20	2	10
Calomel	50	3	10
Subnitrate of Bismuth	50	3	10
Capsicum	45	5	15
Powdered Digitalis	15	3	15
„ Assafætida	30	2	10

An Improved Method of Making Phosphorus Pills. E. F. Cherry. (*Pharm. Journ.*, 3rd series, x., 181.) Three grains of phosphorus are treated in a small wide-mouthed bottle with half an ounce of chloroform until dissolved. The phosphorized chloroform is then transferred to a mortar containing 150 grains of pulv. glycyrrhizæ. By stirring continuously for a few minutes, a dry powder is

obtained consisting of liquorice combined with the phosphorus in a minute state of division. This forms a good pill-mass on the addition of equal parts of syrup and mucilage of acacia.

The advantage of this process over the official one consists in its being less troublesome, and yielding a product much more soluble in the stomach.

Pill Coating. R. H. Dymock. (*Amer. Journ. Pharm.*, September, 1879.) Of the various modes of pill coating, that with gelatine is found by the author to be the most satisfactory, especially if applied in the following manner:—

R. Gelatin	5vj.
Acid Acetic, No. 8	f 3j. 5vj.
Spirit of Nitrous Ether	f 3j.
Granulated Gum Arabic	5j.
Oil of Gaultheria	m℥.

Dissolve the gelatin and gum in the acetic acid with the aid of a water-bath, then add the other ingredients, and mix. If the coating solution is to be used with needles alone, substitute for the gum two drachms more of gelatin. Keep securely corked in a wide mouth bottle. Make the pill mass a very little softer than ordinarily; use as little powder as possible in rolling out; when the mass is nearly brought to the proper length for cutting, lay a thread long enough to reach over the sides of the machine before the pill mass, then roll to the proper length and form pills by the machine. With some masses it may be necessary to cut with a sharp knife a slit in the top of the roll, then lay the thread in the slit and close by rolling. If the mass is of proper consistency and the machine handled right, every pill will be nicely formed and all connected *by the thread*. Then take hold of each end of the string of pills, shake off powder if there is any adhering, dip in the coating solution and twirl as though it was a toy buzz-wheel, which will throw off excess of coating; then hang up by placing pins through each end of the thread and then into wood, and expose to as cool a draught of air as possible. When hard enough to place in the box, cut the thread close to each pill with a pair of scissors or sharp knife, thus leaving no hole in the coating; the little piece of thread in each pill, in length equal to the diameter of the pill, should do no harm.

Tincture of Senega as an Emulsifying Agent. H. Collier. (From a paper read before the Pharmaceutical Society, Feb. 4, 1879, and printed in the *Pharm. Journ.*, 3rd [series, x., 621.) Having

previously observed the power of tincture of soap bark (*Quillaja saponaria*) as an emulsifying agent (*Year-Book of Pharmacy*, 1879, p. 514), the author extended his experiments in the same direction to tincture of senega, owing to the supposed identity of senegin, or polygalic acid, with saponin. Though the literature of senega exhibits differences of opinion as to this identity, the author believes with Bolly, that the two substances are the same, as both yield the same decomposition products; and he attributes the differences in the statements of various authors on this point to the different degrees of purity of the substance which they obtained. Both are alike in their power of emulsifying fixed and volatile oils.

The author is mindful of the fact that emulsifying agents as a rule ought not to possess very active properties, but thinks no objection can be raised against the tincture of senega, on account of the minute quantity required for the purpose. The following is the general formula for cod-liver, olive, castor, and other fixed oils :—

Oil	. . . . .	$\frac{1}{2}$ fluid ounce.
Tincture of Senega	. . . . .	5 minims.
Water	. . . . .	$\frac{1}{2}$ fluid-ounce.

The same quantity of tincture has been used with success for 20 minims of oil of turpentine: half a fluid drachm of copaiba; one drachm of extract of male fern; and 10 minims of chloroform.

The Pharmacopœia dose of tinct. senega is from one-half to two fluid drachms. The use of a sixth part of the minimum dose can hardly be objected to on account of the effect it might produce.

For the suspension of resins or tolu, tincture of senega appears less applicable than acacia or tragacanth, as the quantity of tincture required to produce a good result in such cases is much greater than that required for emulsifying oils.

Tincture of Kino. R. Rother. (*New Remedies*, July, 1879.) The author carried out a number of experiments with the object of studying the cause of the well-known instability of this tincture. It was found that contact with air is the sole cause of the gelatinization, and that this change is in no way favoured or retarded by the presence or absence of light. A tincture weak both in kino and alcohol appeared to be the most permanent in the presence of air; while a concentrated tincture, especially when prepared with strong alcohol, proved to be the most unstable form. The gelatinous condition is, therefore, attributed by the author to an oxidation product. The ramifying propensity of this insoluble substance

causes it to pervade the liquid with invisible filaments, and thus produce the impression of homogeneity. On the appearance, however, of the slightest trace of viscosity, the addition of water precipitated the gelatinous body in purplish flakes which rapidly subside, leaving a red supernatant solution.

The abundant supply of air in large bottles promoted the transformation at a higher rate, the tinctures in the smaller phials requiring a proportionately longer time to undergo decomposition. When the tincture is yet homogeneous, the liquid adhering to the walls of the vessels, after agitation, all runs down again; but after the alteration has begun, much of the liquid permanently adheres, the insoluble matter, owing to its uneven contraction, giving the residue after drying a peculiar veined appearance. The partially gelatinized tinctures cannot be filtered, the viscid body retaining the liquid portion. The semi-congealed fluid, however, on drying yields a compact residue, from which alcohol or water readily removes the soluble parts. In fact, it seems as though much of the kino of the market is the residue of a partially gelatinized juice, and it is probable that the instability of some tinctures is partly chargeable to this altered gum. The success that is claimed to the U. S. officinal method of preparing the tincture, that is, the percolation through sand, may be accounted for by the fact that this very faulty operation sacrifices a large proportion of the gum by agglutination amidst the sand, thus yielding a weak percolate; such a solution having, according to the writer's experiments, elements of more stability. A trial of oxidation with potassium permanganate was made, but since this agent in contact with organic matter always gives a precipitate of manganese dioxide, its effect in this instance was not easily judged. Still, a weak solution of permanganate acidulated with acetic acid poured in the tincture produced a precipitate which, although it may have been contaminated with dioxide, yet had great resemblance to the curdy, flesh-coloured mass thrown down by water from the tincture in an advanced state of change.

In conclusion, the author insists that tincture of kino is best prepared by maceration with a weak alcohol, and then preserved in small phials, well filled and securely stoppered, so as to exclude the action of the air.

The Recovery of Residual Tinctures from Marcs by upward Displacement with Water. W. Elborne. (*Pharm. Journ.*, 3rd series, x., 973.) The author recommends a process which he has tried and found successful in the preparation of the officinal tinctures. Of

the group prepared by maceration and percolation, the following spirit tinctures were made :—Tincturæ aurantii, calumbæ, cinchonæ cinnamomi, lupuli, and rhei. Of those made with rectified spirit, tincturæ aconiti and zingiberis fort. were selected for trial. The quantity of tincture prepared in each case was one pint, and for those requiring proof spirit, a spirit of '915 sp. gr. was employed, made by diluting the requisite amount of rectified spirit with distilled water to make up 19 instead of 20 fluid ounces, and then adding $2\frac{1}{2}$ drachms more of rectified spirit, thus allowing for the contraction of volume and for the immediate use of the mixture. The following *modus operandi* was adopted :—

The powdered ingredients are macerated with the whole of the spirit (of '915 sp. gr.) for the specified time with occasional agitation; the supernatant liquid is then drawn off, the dregs stirred up, transferred to a percolator, and allowed to drop until the liquid passes clear and bright; the receiver is then attached, and both the turbid and supernatant liquids returned to the percolator. Instead of tying a piece of muslin over the bottom of the percolator, as is usually done, a cork is inserted with a hole bored through the centre capable of admitting a piece of ordinary glass tube, above which is put an inch layer of coarsely pounded glass, to prevent the orifice becoming choked. Percolation being complete, another half-inch layer of glass is placed on the top of the marc, to prevent the floating of solid particles. Having removed the receiver and supported the percolator on a retort stand, the open end of a piece of glass tube two inches long is inserted in the cork, the other end of the tube being previously drawn out in the flame so as to leave only a capillary opening. To this end is attached about a yard of india-rubber tubing communicating with a vessel placed above containing distilled water, the pressure of a column of water being thus obtained. The india-rubber tube being filled with water and adjusted to the percolator, the wire clamp attached to the lower portion of the tube is removed, when a slow and steady flow of water commences; after the lapse of an hour and a half sufficient displacement will have been effected, the water having risen considerably above the marc, and with it will have been removed the retained tincture, which forms a dense stratum upon its surface. On dipping a glass rod into this upper stratum and applying it to a flame, the displaced tincture burns nearly as readily as the percolated portion, indicating its comparative strength of spirit. Nevertheless, diffusion will have taken place to a slight extent, and is perceptible by the gradual shading off of the highly-coloured

tincture into the water beneath it. To finish off the tincture, its measure is brought up to $19\frac{1}{2}$ ounces by the addition of the requisite quantity of surface liquid from the percolator, the product filtered and made up to a pint with proof spirit. From the measure of the product of percolation it is known exactly how much surface liquid to draw off to bring the measure up to $19\frac{1}{2}$ ounces, which is done by means of a glass siphon, and having mixed the two products, filtered by the automatic method through a thin 3-inch paper, and made up to a pint with proof spirit, a tincture is obtained with comparatively small loss. On reference to the table below the results arrived at will be seen. The first column indicates the percentage loss of tincture prepared by the B. P. process, and represents notes taken by Mr. Umney when these tinctures were prepared on the large scale with the use of the hydraulic press. The second column, showing the loss by upward displacement, was obtained by taking the specific gravity of $2\frac{1}{2}$ ounces of liquid distilled from 8 ounces of surface water left in the percolator after completion of the tincture, referring to tables specially compiled for estimating the percentage of alcohol in its aqueous mixtures, and to that result adding the centesimal loss by filtration. With the proof spirit tinctures, in each instance the specific gravity of distillate was very constant, indicating an average final loss of 5 drams to the pint. The third shows the specific gravity of completed tincture taken in a Regnault's bottle, and the fourth the amount of solid constituents contained in a fluid ounce, obtained by evaporating to dryness over a steam-bath.

	Loss per cent. (by vol.) by B. P. Process.	Loss per cent. by Upward Displacement.	Specific gravity of Tincture.	Amount of dry extractive matter per fl. oz. (in grs.)
Tinct. Aconiti	7.9	2.5	.858	8.68
Tinct. Aurantii	6.3	3.85	.948	13.7
Tinct. Cinchona	15.0	5.0	.944	13.4
Tinct. Cinnam.	10.0	3.03	.942	7.99
Tinct. Calumbæ	7.1	3.0	.940	7.39
Tinct. Lupuli	10.0	2.89	.948	9.32
Tinct. Rhei	5.0	2.7	.950	15.9
Tinct. Zingib. fort. . .	37.0	7.5	.848	7.9
Tinct. cinchonæ (by upward displacement and distillation), sp. gr. . .	—	—	.945	—

With all these tinctures the process proved to answer very well. In each prepared with proof spirit, the water did its work with

comparative uniformity and absence of clogging, with the exception of tinct. zingib. fort. The time occupied in the various displacements was generally from an hour and a half to two hours, and in the case of tinct. rhei, three hours. Also, when the percolator was quite empty the water required fifty minutes to rise to the same level at which all the displacements were brought; this is mentioned to draw attention to the capillary tube which regulates the supply of water. The percolator was two inches in diameter and was cylindrical, which form is preferable to any other for this process, as it exposes the liquids to a uniform surface. In the case of tincture of rhubarb, tincture of orange peel, and others of a similar kind, it is advisable to allow the tincture to stand for twelve hours previous to filtration, in order to ensure the complete separation of mucilaginous matter, and the permanent brightness of the filtered tincture.

Unguentum Hydrargyri Nitratis. A. A. G. Starck. (Abstract of an inaugural essay. *Amer. Journ. of Pharm.*, 1879, 438.) From the results of a number of experiments made under varying conditions with lard, lard oil, neatsfoot oil, olive oil, sweet almond oil, and castor oil, the author has come to the following conclusions :—

1. That lard oil is better adapted for the preparation of citrine ointment than lard or neatsfoot oil, because it forms, with the quantity of nitric acid required for that purpose, a preparation more stable and unctuous in its character. Lard, when acted on by H N O_3 , becomes hard and brittle, and neatsfoot oil changes into a granular, unsightly mass.

2. That the regulation of the temperature is of the greatest importance, inasmuch as the colour of the preparation depends greatly upon it.

3. That the oxidation of the fat, as proposed by Mr. Rother in 1870, previous to the addition of the mercurial solution, is an important step, and should be done with care and constant stirring, in order to keep the acid well suspended in the mixture, which, on account of the greater density of the acid, has a tendency to separate.

A sample of citrine ointment, prepared by the author with lard oil in place of lard, and kept excluded from contact of air at a temperature ranging between 40° and 60° F., did not show any sign of change after more than six weeks.

It is somewhat softer than simple cerate, and easily worked when rubbed upon a slab.

The following formula was found to give the best results :—

Mercury	℥iss.
Nitric Acid (sp. gr. 1·420)	℥iiiss.
Best Lard Oil	℥xvss.

Heat the lard oil in a porcelain vessel to about 200° F., and add nitric acid 1½ troy ounce, a little at a time, with constant stirring by means of a glass rod, until combined, before more acid is added. Regulate the heat so as to keep up a mild boiling. Finally, set aside to cool slowly. In the meantime put the mercury into a chemical flask, add the remainder of the nitric acid, and dissolve by aid of heat in the open air. When the oxidized oil commences to congeal, add the mercurial solution to it, and stir until it is cold. Put the finished product in 1 or 2 oz. pots, and keep in a cool place, and excluded from light and air.

Unguentum Hydrargyri Nitratis. W. B. Humrich. (Abstract of an inaugural essay. *Ibid.*, 438.) From his experiments, the author concluded that *elaidin* would be the proper base for the ointment of nitrate of mercury, and proceeded to make that compound, from both expressed oil of almonds and olive oil, as follows:—

In each case the oil was heated over a water-bath to the temperature of 200° F., and nitric acid added, several drachms at a time, until ten drachms of acid had been used to each fluid ounce of oil. During the process considerable effervescence occurred, and copious red fumes were evolved. The heat was continued for a short time after effervescence ceased, in order to evaporate the water.

The *elaidin* prepared from almond oil was of a deep yellow colour, quite soft, very sticky without feeling greasy, and rather disagreeable to the touch; while that prepared from olive oil was of an opaque, light yellow colour, quite smooth and soft to the touch, not at all sticky, and superior to that produced from almond oil.

Taking this *elaidin* prepared from olive oil as a base for the ointment, the following formula was followed :—

Mercury	parts by weight, 45
Nitric Acid (sp. gr. 1·42)	105
Elaidin	495

This produced a very pretty yellow ointment, and one which no doubt would keep well, but which, even at the ordinary temperature, is exceedingly soft, almost liquid. In order to overcome this difficulty, stearic acid was substituted for part of the *elaidin*, as follows :—

Mercury	. . . .	parts by weight,	45
Nitric Acid (sp. gr. 1.42)	. . . .	" "	105
Elaidin	. . . .	" "	247½
Stearic Acid	. . . .	" "	247½

This was found to produce a beautiful pale yellow ointment, about the consistence of simple cerate, not liable to change colour or to decompose. The greatest objection, however, is that the ointment has a slightly granular appearance, and does not soften very readily at the temperature of the body. Freshly rendered beef suet, a substance which is scarcely acted upon by the air, was therefore used in place of the stearic acid, as follows:—

Mercury	. . . .	parts by weight,	45
Nitric Acid (sp. gr. 1.42)	. . . .	" "	105
Elaidin	. . . .	" "	247½
Beef Suet	. . . .	" "

This produces a beautiful deep yellow ointment, scarcely of the consistence of simple cerate, but still firm enough for dispensing. It retains its colour and freedom from rancidity perfectly.

Mel. Depuratum. F. E. Bourquin. (*Pharm. Zeitung*, 1879, 632 and 638.) In a comparative trial of the various modes of clarifying honey, the author obtained the best result by rapidly heating 1 kilogram of the crude honey with 0.02 gram of tannin and 1-1½ gram of Irish moss. The honey generally becomes perfectly clear after heating for a very short time, while all impurities, together with the Irish moss, rise to the surface, and are skimmed off or removed by straining. The product is free from tannin, as this is precipitated in the form of an insoluble compound during the process.

Mel. Depuratum. F. Juehling. (*Pharm. Zeitung*, 1879, 719.) The author objects to the use of tannin in clarifying honey, as traces of it always remain in the product, and react with iron, quinine, and some other substances along with which the clarified honey may occur in prescriptions. He prefers the following method:—6 kilograms of honey are dissolved in 3 kilograms of water on a water-bath. About one sheet of filtering-paper, previously triturated into a pulp with water, and freshly precipitated and washed aluminium hydrate are added, until a filtered sample, transferred to a test tube, appears perfectly bright. After cooling, the liquid is passed through a linen or cotton strainer and evaporated to the weight of 6 kilograms. The quantity of aluminium hydrate precipitated from 500 grams of alum and 600 grams of soda is more than sufficient.

The Removal of Fixed Oil from Colchicum Seed. E. L. Bærner.

(From the *Proceedings of the American Pharmaceutical Association.*)

With a view of determining upon a suitable solvent for the fixed oil contained in colchicum seed, one which, while removing all this objectionable constituent, would yet dissolve out none of the active principles of the drug, the following course was pursued, viz.:—Separate portions of the drug in powder No. 60, were treated by percolation, the one with gasolin, a second with petroleum benzin, and a third with stronger ether, U.S.P; the several percolates resulting were carefully evaporated until entirely free from the odour of their respective solvents.

The fixed oil thus obtained was of a density not unlike that of castor oil at a summer temperature, of a fatty odour, a pale olive colour, and very slightly bitterish taste in the case of the gasolin and petroleum benzin residues, whilst that exhausted with ether was of a somewhat darker colour and more decidedly bitter.

To ascertain whether the oil, as removed from the powdered seed by the process described, contained any colchicine, portions of the three residues were severally agitated with distilled water acidulated with hydrochloric acid, the liquids filtered, and the filtrates treated for colchicia, as follows:—

That from the ethereal preparation gave, with concentrated nitric acid, concentrated sulphuric acid, hydrochloric acid, and carbonate of potassium, a lemon yellow coloration; a slight white flocculent precipitate with tannic acid; a denser, nearly white, flocculent precipitate with iodo-hydrargyrate of potassium; a heavy, kermes-coloured, flocculent precipitate with iodine, and a turbidity with chlorine water; the solution becoming yellow upon the subsequent addition of ammonia solution, while the filtrates from the gasolin and petroleum benzin residues, when treated in exactly the same manner, gave no precipitates with any of the reagents mentioned, only a slight yellow coloration being produced by concentrated sulphuric acid.

Upon subjecting a portion of fixed oil separated from a fluid extract prepared by the process of the U. S. P. of 1870 to the same treatment as was pursued in the foregoing experiments, a slight yellow coloration was produced with each of muriatic, nitric, and sulphuric acids.

Ether, because of its solvent action upon colchicine, as well as on account of its greater cost as compared with the other solvents used, was considered objectionable, and was accordingly abandoned for any further experiments. Gasolin and petroleum benzin having,

apparently, about equal solvent powers, the former of these was preferred as being more readily expelled from the drug after percolation with it, and before subjecting to the usual treatment for the preparation of the fluid extract. Upon treating a larger quantity of the powdered seed with gasolin, in the manner described, an oil answering to the description of that first mentioned was obtained to the amount of 9.05 per cent., and having a specific gravity of .922 at 60° F.

A portion of this oil tested for the presence of colchicine in the same manner as that obtained by a previous experiment, gave exactly the same results.

A suitable solvent having thus been found for the fixed oil contained in colchicum seed, its removal from the drug, before treatment in the usual manner for the fluid extract, would seem practicable, as the product obtained, unlike that of the officinal process, which separates the oil upon standing and necessitates its removal, is a perfect preparation.

The advantages resulting from such a removal of the oil would seem to be quite evident, inasmuch as the fluid extract would not then be loaded with it, and would present a much more elegant appearance than does the officinal preparation. This extract being miscible with water, might perhaps even be used hypodermically, by evaporating off the alcohol and diluting with water. The more evident may seem these advantages when it is remembered that nothing is sacrificed medicinally, and only a slight expense incurred for gasolin, the quantity necessary for exhaustion being scarcely twice the weight of the powder to be treated with it.

NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Boracic Acid as a Preservative. H. Endemann. (*Chem. News*, from *Journ. Amer. Chem. Soc.*) Boracic acid has for the last ten years held a place amongst our antiseptics, and has frequently been recommended for the preservation of meats and vegetable substances. The original discoverer, Gahn, sold in Europe two mixtures. The one was a mixture of one part of boracic acid with one part of alum; the other one part of boracic acid with two of alum. These were called respectively "aseptine" and "double aseptine." Provisions in part preserved by boracic acid are generally within the time of from one to two months covered with a black crust, provided they are kept in the ordinary oak provision barrels. Alum prevents this.

It was found that fresh beef, packed with 1 per cent. of boracic acid and a salt pickle of 50 per cent., remained sweet and wholesome for several months, even if kept at an average temperature above 80° F. It was likewise found that previously salted beef could not be preserved by boracic acid. From this it was evident that the process of salting removed from the beef certain substances, in the absence of which preservation became impossible. These substances proved, on further investigation, to be the phosphates. It was, therefore, not the boracic acid which had been the cause of the preservation, but, rather, substances which are produced by the action of the boracic acid—the acid phosphates.

During his investigations regarding the disinfecting properties of various substances, he found it very difficult to develop bacteria in a fluid containing acid phosphates, and also that many acids were powerful disinfectants, destroying the life of bacteria completely, even if present only in small quantities. One part of hydrochloric acid in sixty-four parts of Cohn's fluid, well stocked with bacteria, destroyed these completely. He was led, therefore, to make experiments in which boracic acid was replaced by equivalent quantities of other inorganic acids, and thus ascertained that exactly the same

results could be reached as with the use of boracic acid. The best results were reached by the use of phosphoric acid, and mixtures of phosphoric acid and hydrochloric acid.

Phosphoric acid, even in dilute solution, acts powerfully on fresh meat, covering it with a white layer of coagulated albumen, which however, on standing gradually disappears. Mixtures, however, in which the P O_5 is partly replaced by H Cl , do not act in a like manner; and even if some precipitation should take place, will soon allow the meat to recover its original appearance. Meats thus treated keep exceedingly well, and at least fully as well as when preserved, under similar circumstances, with an equivalent quantity of boracic acid.

The preservation by means of boracic acid cannot, therefore, be considered as involving a new principle; it is merely a variation of, but by no means an improvement on, the time-honoured pickling. The insipid taste of free boracic acid and the acid phosphates prevents its easy detection, and brings consumers to the belief that the meat is fresh. This peculiarity is the only one recommending the use of boracic acid.

Menthol, a New Antiseptic. (From the *Lancet*.) Menthol, or peppermint camphor, is a crystallizable body deposited from Chinese oil of peppermint on exposure to cold. It is met with in the form of small, colourless, fragrant prismatic crystals, not unlike sulphate of magnesia. In fact, when first imported from Japan, some twenty years ago, it was suspected to be nothing but Epsom salts flavoured with peppermint. It is now known to have a definite chemical composition, and to be the camphor, or stearoptene of peppermint oil. It is but slightly soluble in water, although it imparts to it its characteristic smell and taste. It dissolves readily in alcohol and ether, and in oils, both fixed and volatile. It melts at about the temperature of the body, and when further heated volatilizes without decomposition. From a series of experiments recently undertaken by Mr. Archibald Duncan, a student of the University of Edinburgh, it would appear that it is possessed of antiseptic properties similar to those of its homologue, thymol. At present it can hardly be regarded as a commercial article; but it could be readily imported from Japan, and there is no reason to suppose that its price would be prohibitive. An impure sample sent over from Canton, in 1872, was valued at 30s. a pound. We are not aware that it has been used in therapeutics; but strong oil of peppermint painted over the part has long been a favourite mode of treatment in China for gout and neuralgia, and it might prove useful in these

complaints. The Japanese "po-ho-yo," or neuralgia remedy, probably contains menthol.

A New Preserving Fluid. (*New Remedies*, January, 1880.) The Prussian Secretary of State for Education has caused the publication of the following compound, and method of its application discovered by Wickersheimer, the preparator of the anatomical museum of the University at Berlin, who had at first patented the compound, but was induced to renounce his patent claims.

In 3000 parts of boiling water dissolve 100 of alum, 25 of sodium chloride, 12 of potassium nitrate, 60 of potassa, and 10 of arsenious acid. Let cool and filter. To every 10 litres of the filtrate, add 4 litres of glycerin, and 1 litre of methylic alcohol.

Its application differs with the special objects to be preserved. In general, the objects must be impregnated with it. If the objects are to be preserved dry, they are soaked in the liquid from six to twelve days, and afterwards dried in the air. Ligaments, muscles, and other animal objects remain perfectly soft and movable. Hollow organs, as lungs and intestines, should be filled with the liquid, previous to immersion in it. After being taken out, and before drying, it is advisable to inflate them with air. Injecting the liquid into a corpse will preserve the latter completely, and the muscular tissue will always retain the natural colour of fresh corpses. To preserve the outward appearance of the latter, they should be well impregnated externally, and enclosed in air-tight cases. This is only necessary to preserve the exact original appearance; if it is not done, the body will keep equally well if thoroughly injected, but the exterior will gradually become somewhat dry and dark coloured. Plants may likewise be preserved by this liquid.

Bonjean's Ergotin. A. Catillon. (From *Répert. de Pharm.*) The author gives the following method for the preparation of Bonjean's ergotin. Powdered ergot is packed in a displacement apparatus and covered with 75 per cent. alcohol. After twelve hours a fresh quantity of alcohol is added, until 5 parts of the latter have been used for every 1 part of ergot. The last portions of the alcohol are displaced by water, taking care not to use an excess of the latter, about as much as the weight of ergot. The percolate is then subjected to distillation until an aqueous solution of an extract is left floating on a resinous substance. When cold, the solution is decanted, the residue washed with a little distilled water, the whole filtered and evaporated on the water-bath. After some time, during the evaporation, there will be noticed on the surface a slight insoluble pellicle, which may be disregarded, or else removed

by filtration. The evaporation should be carried to pretty firm consistence. The resulting extract is of fine red colour, brighter than that of the aqueous extract, and of agreeable odour. It is completely soluble in 70 per cent. alcohol and in water (10 grams dissolved in water leave on the filter a residue weighing only 15 milligrams). On ignition the extract leaves 6 to 8 per cent. of ash, while the aqueous extract only leaves 5 to 6 per cent. The mean yield of ergot in aqueous extract, is 7 to 8 per cent., in alcoholic extract over 10 per cent.

Liquid Preparations of Lactucarium. J. L. Lemberger. (From *Proc. Amer. Pharm. Assoc.*) The following are offered as good working formulæ for a fluid extract, tincture, and syrup of lactucarium.

Fluid Extract of Lactucarium.

℞ Lactucarium	16 troy ounces.
Petroleum Benzin, deodorized	32 fluid ounces.
Diluted Alcohol	a sufficient quantity.

Beat the lactucarium thoroughly in an iron mortar, then introduce it into a wide-mouth bottle of about three pints capacity, adding the benzin, corking tight, and allowing it to macerate, with frequent agitation, for twenty-four hours; then let it rest about twenty-four hours, or until the lactucarium subsides and the benzin solution becomes clear, or nearly so; then, having decanted the benzin solution, transfer the lactucarium to a stone or glass slab, or other similar vessel, spreading it as thin as possible, allowing it to remain in this situation until completely dry (at least twenty-four hours); then rub it up in an iron mortar with an equal bulk of clean sand; next introduce it into a cylindrical percolator, first prepared with a disc of flannel and a thin layer of sand, packed lightly, and add sufficient diluted alcohol to cover several inches, and after closing the outlet with a cork or otherwise, allow it to macerate twenty-four hours; then percolate to exhaustion, reserving the first four fluid ounces. By means of a still reclaim the alcohol, and evaporate the residue in a water-bath to ten fluid ounces, mixing this with the reserved percolate, and filter, adding sufficient diluted alcohol to wash the filter and remaining residue until the product weighs sixteen troy ounces.

With this fluid extract you can readily make—

Tincture of Lactucarium.

℞ Fluid extract of Lactucarium	1 troy ounce (ʒj.)
Diluted Alcohol	q. s. for fʒviij.
A fluid drachm representing 7½ grains.	

Syrup of Lactucarium.

- ℞ Fluid extract of Lactucarium . . . 1 troy ounce (ʒj.)
 Simple Syrup q. s. for ℥xvj.
 A fluid drachm representing 3½ grains.

Tincture and Fluid Extract of Quebracho Bark. Dr. Vulpinus. (*Pharm. Zeitung*, 1880, 70.) The author recommends the following formulæ:—

Tinctura Quebracho.—Take of quebracho bark 100 parts, alcohol and distilled water, of each 225 parts (by weight). Digest for eight days; then express and filter.

Extractum Quebracho Liquidum.—The bark is extracted on a steam bath twice successively with ten times its weight of water; the united liquors are allowed to settle, strained, evaporated to the consistence of an ordinary extract, and then dissolved in a sufficient quantity of water to make the solution equal in weight to the bark used. The solution is left to deposit in a cool place for several days, and then filtered.

Preparations of White Quebracho Bark. (*Aspidosperma Quebracho*.) Dr. Burgos. (*Revista Farmacéutica*, Nov., 1879. From *Pharm. Journ.*)

Powder of Quebracho Blanco.—Possesses all the physical and organoleptic properties of cinchona powder; in colour it is intermediate between the red and yellow barks. It is prepared in the same manner, and can be used for the same purpose pharmaceutically, as an antiseptic alone, or mixed with wood charcoal, or as an ingredient in dentifrice powders, electuaries, etc.

Infusion.—The infusion is similar to sherry in colour, clear and transparent. It has a bitter taste, analogous in every respect to that of infusion of cinchona, but more pronounced. It is prepared with the same proportion as the decoction.

Decoction.—Quebracho bark, bruised, 1 part; water, 20 parts. Dr. Mantegazza prepares it in the proportions of 1 to 12 or 18. The decoction is more intense in colour than the infusion, and if it be concentrated so as to reduce it to one-third, it acquires a colour as deep as that of port wine. It remains clear whilst kept at an elevated temperature, but as it cools it deposits an abundant precipitate. A few drops of sulphuric acid restore partially its transparency by dissolving the alkaloid it contains. If added to a solution of sulphate of iron, a very large quantity of greenish grey precipitate is produced. With ammonia it undergoes no alteration.

The decoction is used as a tonic and febrifuge, and it is the form in which quebracho is administered in the provinces where paludal fevers prevail.

Digestion.—Made with sulphuric or acetic acid in the proportions indicated for the preparation of the alkaloid according to Fraude's method. At the end of four to six days it is as intense in colour as the concentrated decoction, and has a much more bitter taste, as it contains much alkaloid in solution.

It can also be prepared for internal use with a smaller quantity of sulphuric acid.

Tincture.—Quebracho bark, bruised, 1 part; alcohol, 56°, 5 parts. Macerate during eight days, and filter. (This formula corresponds to the tincture of cinchona of the Codex.)

Compound Tincture.—Quebracho bark, bruised, 2 parts; orange peel, 1 part; alcohol, 56°, 15 parts.

Wine.—Quebracho bark, bruised, 1 part; alcohol, 56°, 2 parts; white wine, San Juan or Mendoza, 16 parts. Leave the alcohol in contact with the bark during twenty-four hours, then add the wine, macerate for eight days, and filter. The use of one or other of these wines is recommended, because they contain little tannin and possess a special aroma that communicates an agreeable flavour to the preparation.

An *Elixir*, very pleasant to the palate, is made by adding sugar to this preparation.

Extracts.—Both the aqueous and alcoholic extracts may be prepared by the ordinary processes.

Syrup.—Quebracho bark, 3 parts; water, 32 parts; sugar, 16 parts. Boil the bark with the water, filter, and evaporate down to the fourth part, add the sugar and make the syrup *secundum artem*.

Preparations with the Alkaloid.—Aspidospermine, or quebrachine, is insoluble in glycerine. It dissolves readily in fats and fixed oils, and may be incorporated with cod liver oil in larger proportion than quinine. The following is a suitable formula:—

Cod liver oil, 100 parts; aspidospermine 6 to 8 parts: dissolve with the aid of heat. It is easy to conceive the usefulness of such a preparation as this, in which the special properties of the oil are joined with those of the alkaloid, and which in small doses acts as an eupeptic.

A Vehicle for Castor Oil. (*Amer. Journ. of Pharm.*, 1880, 372.) The oil is poured on the top of the following mixture:—

R	Syrup of Orange Peel	f 3j.
	Syrup of Gum Arabic	f 3ss.
	Caramel	f 3j.
	Tartaric Acid	grs. xxv.
	Water	f 3iv.

Mix.

Having dissolved the acid in the water, add the syrups and caramel, and stir; then pour the oil on the top of this mixture. Wrap up 30 grains bicarbonate of soda in a paper, which can be marked effervescing powder. When the patient is to take the dose, the bicarbonate is added and the mixture well stirred, producing a thick froth which completely envelops the oil.

Malt Extract with Cod Liver Oil. Dr. H. Hager. (*Chem. and Drug.*, Jan., 1880, 13.) The author publishes the following:—

R	Ol. Morrhuæ	50 parts.
	Gum Arabic	20
	Water	35

Make an emulsion, and mix with 150 parts malt extract.

Casein, and the Action of Rennet. O. Hammarsten. (*Bied. Centr.*, 1879, 147. From *Journ. Chem. Soc.*) Pure casein may be prepared by precipitating with acetic acid, care being taken to avoid excess of acid, dissolving the washed precipitate in alkali, so that the solution remains slightly acid, filtering from separated fats, reprecipitating several times by acetic acid, and washing with alcohol and ether. The casein thus prepared appears to be a weak acid, dissolving calcium and barium carbonates, and calcium phosphate. Salts appear to keep casein in solution, and this accounts for the fact that, in the precipitation of casein by acids, the amount obtained is not equivalent to the acid employed. Rennet, when it precipitates casein, appears to break it up into two albuminoids: one, which is greatest in quantity is combined with calcium phosphate, and appears as cheese; the other (a peptone) remaining dissolved in the whey. For complete precipitation, the presence of calcium phosphate is necessary, and this accounts for the fact that dilute milk cannot be coagulated. The presence of calcium chloride also partly aids curdling, and 1 part of rennet ferment is capable of curdling 800,000 parts of casein.

Emulsion of Cod Liver Oil and Phosphate of Calcium. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, April, 1880.) The following will be found to make a satisfactory and pleasant preparation:—

℞	Calcii Phosphatis	5ij. gr. viij.
	Acid. Hydrochlor.	q. s.
	Liq. Ammoniae	q. s.
	Aquæ	f 5iij.

Mix the phosphate with a small portion of the water, and the acid in sufficient quantity to dissolve, filter through cotton, and add the remainder of the water. Pour into this an excess of solution of ammonia, wash the precipitate on muslin until the washings are tasteless, and, after thoroughly squeezing it, mix it with the following ingredients, viz. :—

℞	Ol. Morrhuæ	f 5iij.
	P. g. Acaciæ	5vj.
	P. Sacchari albi	5x.
	Ol. Sassafras	gtt. xv.
	Ol. Gaultheriæ	gtt. xj.
	Ol. Cinnamomi	gtt. iv.
	Aquæ q. s. ft.	f 5viij.

Rub the phosphate of calcium with the sugar and gum in a mortar, and add sufficient water to reduce it to the consistence of cream ; add this to the oil previously put in a bottle, and shake well for a few minutes. The rest of the water may then be poured in a little at a time. The essential oils can be mixed with the cod liver oil.

Elixir Glycyrrhizæ Compositum. (*New Remedies*, Oct., 1879.) The following formula has been calculated on the basis of various formulæ heretofore proposed, substituting parts by weight for definite weight and measure. A convenient quantity of the elixir, on a small scale, will be obtained by substituting for part the quantity "10 grains." The resulting product will then measure about 1 pint.

℞	Licorice Root, cut and bruised	90 parts.
	Sugar	200 „
	Water	q. s.

Digest the licorice root with 600 parts of water for an hour on a water-bath, then heat to boiling, boil for about fifteen minutes, and then strain with strong expression. Pass through the strainer enough water to make the decoction weigh 700 parts. Then take of—

Star Anise, in No. 40 powder	6 parts.
Cinnamon, in No. 40 powder	5 „
Coriander, in No. 40 powder	4 „
Caraway, in No. 40 powder	2 „
Nutmeg, in No. 40 powder	1 „
Alcohol, 93 per cent.	q. s.
Water	q. s.

Mix the powders, pack them firmly in a conical percolator, then pour upon them about one-half of a mixture of—

Alcohol	70 parts.
Water	40 „

When the percolate begins to drop, close the orifice with a cork, and set the percolator aside in a warm place for four days. Then allow the percolation to proceed, pouring gradually more of the menstruum on top, until the percolate weighs 100 parts. Add this percolate to the strained decoction of the licorice, let the mixture stand twenty-four hours, filter, and add the sugar. Dissolve the latter by agitation, then filter again, and wash the filter with enough of a mixture of alcohol, seven parts, and water, four parts, until the whole filtrate weighs 1000 parts.

Artificial Carlsbad Salt. Dr. Uloth. (From *Pharmaceut. Centralhalle*.) The various formulæ published for the preparation of this salt leave out potassium sulphate, which occurs to the extent of 2 per cent. in the saline constituents of the Carlsbad spring. The actual composition of the salt is as follows:—

Sodium Sulphate (anhydrous)	45 parts.
Sodium Bicarbonate	33 „
Sodium Chloride	29 „
Potassium Sulphate	2 „

4 parts of this mixture dissolved in 500 parts of water yields a fair imitation of the Carlsbad Spring.

Chlorinated Cotton. C. C. Pavosi. (*Bull. Farm. Mel.*, 1880, 177.) A saturated solution of chlorinated lime is placed in a jar capable of holding eight times the quantity introduced; a moderate quantity of dilute sulphuric acid is then added, and fine carded cotton, either dry or moistened with glycerin, suspended in the upper part of the jar in such a manner that it does not get into contact with the liquid. The jar is now closed and set aside for twenty-four hours.

Chlorinated cotton is used as a simple means of diffusing chlorine through the atmosphere of surgical wards in hospitals, and also for antiseptic dressings of wounds. For the latter purpose, that prepared with the aid of glycerin is preferable, as it retains its chlorine better than that made without glycerin.

Antiseptic Gauze and Cotton. (From *New Remedies*, Aug., 1879.) The following are given as the most improved formulæ:—

1. *Lister's Carbolyzed Gauze.*

Paraffin	7 parts.
Resin	5 „
Carbolic Acid	1 „

Melt the paraffin and resin and add the carbolic acid. The mixture contains 7·7 per cent. of carbolic acid. The original formula of Dr. Lister prescribed that the mixture should be applied by means of a syringe, provided with a sprinkling nozzle, upon the gauze, and that the latter should then be heated under pressure in an air-tight apparatus. For some time past manufacturers of this gauze have found it more advantageous to dip the gauze into the mixture, and then pass it through rollers in order to remove the excess.

All carbolyzed gauze must be kept in air-tight boxes, to prevent evaporation of the carbolic acid.

2. *Brun's Carbolyzed Gauze.*

Resin, in coarse powder	400 gms. (14 av. oz. 48 grs.)
Castor Oil	40 gms. (1 av. oz. 180 grs.)
Carbolic Acid	100 gms. (3 av. oz. 230 grs.)
Alcohol	2 litres (67½ fl. 3.)

Dissolve the first three ingredients in the alcohol. Saturate the gauze with it thoroughly, wring it out and dry it by hanging it up horizontally, or by shaking it, spread out in lengths of about seven yards; if done in the latter way, two persons holding the two ends and shaking it up and down, it will be sufficiently dry in a few minutes.

This gauze is much softer and more pliable than Lister's, and is free from the drawback of irritating the skin, which is sometimes caused by paraffin.

The above solution contains 10 per cent. of carbolic acid.

3. *Eilan's Carbolyzed Gauze.*

Linseed Oil, boiled	4 ounces.
Yellow Wax	2 „
Resin	4 „
Oil of Turpentine	8 „
Carbolic Acid, Calvert's No. 2	1 „

Melt the first three ingredients, then add the other two. Immerse the fabric in the liquid and pass it through a clothes-wringer several times; then fold it, wrap it in oiled silk or carbolyzed paper, and

keep it in a well closed tin box. The above solution contains a little over 5 per cent. of carbolic acid.

4. *Pohl's Carbolyzed Gauze.*

Deprive the gauze of fat or grease by treatment with caustic soda, thorough washing and drying. Then make a mixture of 100 parts of pure carbolic acid and 5 parts of strong alcohol, of which about 4 grams (1 3) are sprinkled upon each square metre (a little over a yard) of the fabric. This is then introduced into a copper boiler which is provided with a safety valve, and is to be hermetically closed, where it is heated to a temperature of 120° C. (= 248° F.).

5. *Benzoated Gauze or Cotton* (Brun's).

This is either made with a five per cent. or with a ten per cent. solution, viz. :—

(a) Five per cent. solution.

Benzoic Acid . . .	50 gms. (1 av. oz. 334 grs.)
Castor Oil	20 gms. (309 grs.)
{ or Castor Oil . . .	10 gms. (154 grs.) }
{ Resin	10 gms. (154 grs.) }
Alcohol	2430 c.c. (82 fl. oz. 110 min.)

(b) Ten per cent. solution.

Benzoic Acid . . .	100 gms. (3 av. oz. 231 grs.)
Castor Oil	20 gms. (309 grs.)
{ or Castor Oil . . .	10 gms. (154 grs.) }
{ Resin	10 gms. (154 grs.) }
Alcohol	2360 c.c. (79 fl. oz. 447 min.)

The gauze or cotton (which latter should have previously been deprived of oil), is dipped in the liquid, expressed, and dried at a gentle heat.

6. *Salicylated Gauze or Cotton* (Brun's).

(a) Five per cent. solution and (b) ten per cent. solution are prepared exactly like the preceding.

7. *Benzoated or Salicylated Gauze or Cotton* (Thiersch).

These are prepared like those under Nos. 5 and 6; only in place of castor oil an equal quantity of glycerin is used. But this is found not to entirely prevent the loss of benzoic or salicylic acid in the shape of fine dust on handling.

8. *Borated Gauze or Cotton.*

Boracic Acid	10 oz.
Glycerin	4 fl. oz.
Water	q. s. to make 100 fl. oz.

Dissolve by the aid of heat, which should not be raised higher than necessary, but should be kept up during the saturation of the cotton, so that the acid will not crystallize upon it. The cotton must have been previously deprived completely of its fat by boiling with soda, and subsequent thorough washing and drying.

9. *Borated Lint.*

Dr. Vulpius, of Heidelberg, directs to dissolve 1 part of boracic acid in 4 parts of boiling water, to saturate 1 part of lint with this solution, and to dry.

Preparations for the External Application of Chloral Hydrate.

J. Catillon. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 414.)

Livimentum Chloralis Hydratis.

℞ Chloralis hydratis	10·0 grams.
In pulverem terendo redactis affunde	
Olei amygdalarum.	50·0 „
Digere, interdum agitando, donec solutio effecta fuerit.	

D. S. To be applied to the painful parts.

Unguentum Chloralis Hydratis.

℞ Chloralis hydratis.	10·0 grams.
Terendo in pulverem redacta digerendo solve in	
Adipis suilli	45·0 „
Cere flavae	5·0 „
antea liquatis. Solutione peracta liquor in ollam in	
fundo, ut refrigescat.	

The French formula orders white wax, to be replaced by lard during the cold season.

Emplastrum Chloralis Hydratis.

℞ Chloralis hydratis.	10·0 grams.
Terendo in pulverem redacta solve digerendo in	
Cere flavae.	30·0 „
Sebi taurini	20·0 „
antea liquatis. Massam refrigeratum in bacillum redige.	

Suppositoria cum Chlorale Hydrate.

(1)

- ℞ Chloralis hydratis 5·0 grams.
 Terendo in pulverem redacta solve digerendo in
 Cere flavæ 5·0 „
 Olei Cacao 15·0 „
 antea liquatis. Liquor. limpidum in modulos effunde,
 ut quinque suppositoria fiant.

(2)

- ℞ Chloralis hydratis 10·0 grams.
 Cere flavæ 7·5 „
 Olei Cacao. 12·5 „
 Mixtio ut supra efficiatur. Fiant suppositoria quinque.

Suppositoria Vaginalia cum Chloralo Hydrato.

- ℞ Chloralis hydratis. 20·0 grams.
 Terendo in pulverem redacta solve in
 Cere flavæ,
 Sebi taurini ana 20·0 „
 Adipis suilli 30·0 „
 antea liquatis. Massam refrigeratam in quinque sup-
 positoria cylindrica redige

Syrupus Turionum Pini. (*Schweiz. Wochenschr. für Pharm.*, 1880,
 No. 12.)

1. *Vinosus.*

- ℞ Turion. Pini 50 parts.
 infundantur
 Vini albi fervidi sufficiente copia. Dige-
 rantur per aliquot horas et solve leni
 calore in liquoris filtrati 600 „
 Sacchari albi 900 „

2. *Aquosus.*

- ℞ Turionum Pini. 80 parts.
 Kalii carbonici 5 „
 infundantur
 Aquæ fervidæ suff. quant. Stent per duo-
 decim horas. Solve, leni calore, in
 liquoris filtrati 600 „
 Sacchari albi 900 „

Syrupus Cinchonæ et Ferri. Z. Patti. (*New Remedies*, Nov.,
 1879.) First prepare the following:—

Syrup of Cinchona, made with White

Wine	330 grams.
Distilled Water	3 „
Citric Acid	3 „
Tincture of Bitter Orange Peel	10 „

The syrup of red cinchona made with white wine may be made by dissolving—

Extract of Cinchona, aqueous	3.3 grams.
Sugar	184 „
White Wine (Sherry)	143 „

The citric acid is dissolved in the water and mixed with the syrup, then the tincture is added.

Next prepare a syrup of iodide of iron as follows:—

Iodine	3 grams.
Iron, in filings of fine-cut wire	1½ „
Distilled Water	14 „
Simple Syrup	220 „

The iodide of iron is first prepared in the usual manner (see U. S. P.), and the solution filtered. To this filtered solution the syrup is added, and then the latter mixed with the syrup first prepared.

This preparation is beautifully clear; its taste, which participates both of iron and cinchona, is by no means disagreeable, and it can be kept for a long time without depositing or discolouring, as the action of the tannin and similar matters upon the iron is restrained by the citric acid present.

Liquor Acidi Carbolici Compositus. Dr. Hager. (*Pharmaceut. Centralhalle*, 1880, 27.)

Take of

Sumatra Benzoin	100.0 parts.
Aloes	50.0 „
Crude Salicylic Acid	25.0 „

Reduce to powder, and add—

Oil of Spike	50.0 parts.
Oil of Star Anise	10.0 „
Alcohol	1000.0 „

Macerate for one day, shaking occasionally, then add—

Oleic Acid	100.0 parts.
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And a previously prepared solution of—

Crude Caustic Soda	60.0 parts.
Borax	25.0 "
Water	500.0 "

Digest, shaking occasionally, for one day, and to the warm mixture add—

Crude Carbolic Acid (containing 90 to 95 per cent. phenol)	3000.0 parts.
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Shake for half an hour, then set aside in a cold place for a week, and decant the liquid.

The solution is used for killing vermin on animals, and for this purpose it is diluted with about 100 parts of water and applied with a brush. Applied in this manner to horses, it will be found an efficient protection against flies and other insects. It should be used with caution, so as not to touch the eyes or lips. A weak aqueous solution of this liquor may also be used for disinfecting offensive sores.

Nitrate of Silver and Lead: an Improved Caustic. Dr. Sawostizki. (*St. Petersburg Med. Wochenschr.*, 1880, March 25.) This improved caustic is made by fusing together five parts of nitrate of silver and one part of nitrate of lead, and pouring the molten mixture into caustic moulds. The sticks thus obtained can be most readily pointed, and are less liable to break than those of pure nitrate of silver.

Medicated Pencils. M. Legras. (*Répert. de Pharm.*, May, 1880.)

Red Precipitate Pencil.

Pure Glycerin	10 grams.
Cacao Butter	20 "
Red Precipitate	1.5 "

Oil of Cade Pencil.

Pure Glycerine	10 grams.
Cacao Butter	20 "
True Oil of Cade	15 drops.

Iodoform Pencil.

Pure Glycerin	10 grams.
Cacao Butter	20 "
Iodoform	30 "
Oil of Peppermint	6 drops.

Corrosive Sublimate Pencil.

Pure Glycerin	13 grams.
Cacao Butter	27 "
Corrosive Sublimate	1 "

Balsam of Peru Pencil.

Pure Glycerin	5 grams.
Cacao Butter	20 „
Balsam of Peru (the resinous matter precipitated)	5 „

Another Form.

Vaseline	5 grams.
Cacao Butter	20 „
Balsam of Peru	5 „

Turpeth Mineral Pencil.

Pure Glycerin	10 grams.
Cacao Butter	20 „
Turpeth Mineral (Basic Sulphate of Mercury)	1 „
Salep	2 „

Another Form.

Pure Glycerin	10 grams.
Cacao Butter	20 „
Turpeth Mineral	1.50 „

Tar Pencil.

Vaseline	5 grams.
Cacao Butter	20 „
Norwegian Tar	5 „

Belladonna and Opium Pencil.

Pure Glycerin	5 grams.
Extract of Belladonna	5 „
Extract of Opium	5 „
Cacao Butter	20 „

Ophthalmic Pencils.

A.

Red Precipitate	3 grams.
Oxide of Zinc	3 „
Crystallized Acetate of Lead	3 „
Dried Alum	3 „
Corrosive Sublimite	0.45 „
Pure Glycerin	10 „
Cacao Butter	20 „

B.

Red Precipitate	0.30 gram.
Sulphate of Zinc	0.60 „
Vaseline	10 „
Cacao Butter	20 „

C.

Red Precipitate	1.50 gram.
Powdered Camphor	1.50 "
Crystallized Acetate of Lead	1.50 "
Vaseline	10 "
Cacao Butter	20 "

These pencils are covered with tinfoil and paper, so that they can be held in the hand without softening. They are intended to be employed in the treatment of the eyes and face.

Senecio Aureus in Rheumatism. Dr. N. S. Davis. (From *Med. and Surg. Rep.*, November, 1879.) The author speaks highly of the efficacy of this plant in removing the rheumatic diathesis. In a typical case of chronic rheumatic carditis, he prescribes:—

Carbolic Acid	0.40 gram.
Glycerin	16.00 "
Tincture of Gelsemium	16.00 "
Tincture of Digitalis	32.00 "
Fluid extract of Senecio Aureus	96.00 "

Mix. Dose: a teaspoonful in a little water, just before each meal and at bed-time.

Benzoate of Sodium as a Remedy for Diphtheritis. L. Hoffmann. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 313.) The author reports that he has been very successful in treatment of diphtheritis with sodium benzoate, administered in doses of 0.5 to 1 gram every hour. Most striking was the success in all those cases in which this remedy was applied at the beginning of the disease.

A Specific for Whooping Cough. Z. T. Dellenbaugh. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 345.) The remedy recommended by the author is ammonium picrate, administered in the following mixture:—

Ammon. Picrat.	0.06 gram.
Ammon. Hydrochlor.	1.44 "
Extr. Glycyrrhiz.	3.70 "
Aqua	90.0 "

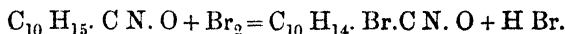
The dose is a teaspoonful for children up to two years of age, and two teaspoonfuls for children three to five years old.

Petroleum as a Remedy in Pulmonary Affections. M. Blache. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 405.) Petroleum, administered in doses of 0.25 gram, contained in capsules, is recommended as a valuable remedy in chronic bronchitis and similar affections of the respiratory organs. It should be taken several times a day. It ceases to nauseate after the first day.

Iodated and Cyanated Camphor. (*Journ. de Pharm. et de Chim.*, and *Archiv der Pharm.*, August, 1879. From *New Remedies*). Although the iodine and cyanogen substitution products of camphor have not as yet found employment in medicine, like the corresponding bromide compound, yet it seems quite probable that they will be experimented with. Both bodies have been obtained by Haller. His primary object was the preparation of cyanated camphor. For this purpose he dissolved a mixture of iodide of camphor (improperly so called; being equal parts of iodine and camphor) and of sodium-borneol (or natrium-borneol) in benzine, and treated this, under the application of heat, with a solution of iodide of cyanogen in benzine. He obtained crystals having the composition $C_{10}H_{15}IO$. When pure they are white, insoluble in water, soluble in alcohol, ether, benzine, etc., melt at $43-44^{\circ}C$., but do not again solidify until cooled to $28-29^{\circ}C$. Heated to $100^{\circ}C$. it volatilizes without decomposition, but at 150° decomposition takes place. This body is mono-iodated camphor.

Cyanated camphor was prepared by very gradually adding to a solution of 100 grams of camphor in 100 grams boiling benzol (temperature between 100 and $110^{\circ}C$.), 8 grams of sodium, and then passing a stream of well-dried gaseous cyanogen through the liquid, until the latter commenced to assume a red colour. The liquid is then transferred to a separating funnel, where it is washed with water, which removes sodium cyanide; the remaining hydrocarbon compound is then treated with caustic soda and allowed to remain at rest, so as to separate the latter. This is several times repeated, the alkaline solutions united, acetic acid is added to faint acid reaction, the resulting white precipitate dried and then dissolved in ether. On evaporating this solution, cyanated camphor, $C_{10}H_{15}CNO$, is obtained in white prismatic crystals, soluble in alcohol, ether, chloroform, glacial acetic acid, and fixed alkalies. It melts at $127-129^{\circ}C$., and boils at $250^{\circ}C$.

Cyanobromated camphor is obtained by treating, at a gentle heat, a solution of cyanated camphor in carbon disulphide with bromine:—



As soon as no more hydrobromic acid escapes, the carbon disulphide is distilled off, the residue is dissolved in alcohol, and crystallized. It forms handsome crystals, soluble in the same solvents as the cyanated camphor, but with greater facility.

Antidotes. Dr. Th. Schlosser. (*Zeitschr. des oesterr. Apoth.*

Ver., 1880, Nos. 1 and 2. From *Amer. Journ. of Pharm.*) In order to supply the demand for a reliable table of antidotes, the author publishes the following.

As a general rule, it is stated that the administration of antidotes is not to be preceded by an emetic whenever the poisoned patient has already vomited freely.

ANTIDOTES FOR:

1. *Aconitia.*

℞ Cupri Sulph.	. . . . .	1·0 gram.
Aquæ dest.	. . . . .	40·0 „

Dissolve. S.: Emetic; give half, and balance, if necessary, in five minutes.

2. *Excessive Etherization.*

℞ Aquæ Ammon.	15 gtt.
Aquæ dest.	20·0 grams.

S.: To be taken at one dose.

℞ Aquæ Ammoniæ	30·0 grams.
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S.: For smelling. (Cold water must be freely applied, and fresh air.)

3. *Caustic Alkalies and Alkali Carbonates.*

℞ Acidi Tartaric	. . . . .	10·0 grams.
Aquæ font.	. . . . .	1000·0 „

M. S.: Drink a tumblerful at once; then every five minutes a dessertspoonful of almond oil, with five tablespoonfuls of the tartaric acid solution. (This is sufficient for 100 grams of a 5 per cent. solution of alkali.)

4. *Caustic Lime and Calcium Salts.*

℞ Magnes. Sulph.	. . . . .	20·0 grams.
Aquæ dest.	. . . . .	100·0 „
Syr. simpl.	. . . . .	40·0 „

Dissolve. S.: Take at once. Then:

℞ Ol. Amygd. Dulc.	. . . . .	20·0 grams.
Pulv. Gum. Acaciæ	. . . . .	10·0 „
Aquæ dest.	. . . . .	15·0 „
Syr. simpl.	. . . . .	100·0 „

M. D. S.: Two dessertspoonfuls every quarter hour.

5. *Alcohol Intoxication.*

R	Pepsini	2·0 grams.
	Aquæ dest.	200·0 „
	Acid. Mur.	1·00 „

M. D. S. : Tablespoonful every five minutes. Or :

R	Aquæ Ammon.	10 gtt.
	Aquæ dest.	150·0 grams.
	Syr. simpl.	20·0 „

M. S. : Take at once.

6. *Ammonia.*

R	Acid. Acet. concent.	10·0 grams.
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S. : For smelling. Then :

R	Acet. crud.	20·0 grams.
	Aquæ dest.	200·0 „
	Syr. simpl.	20·0 „

M. S. : Tablespoonful every five minutes.

R	Acet. crud.	4·0 grams.
	Aquæ dest.	200·0 „
	Syr. simpl.	40·0 „

M. S. : Tablespoonful every five minutes.

R	Aceti crudi	50·0 grams.
	Aquæ dest.	200·0 „

S. : Inhale warm. (Cold washing.)

7. *Anilin Preparations.*

R	Cupri Sulph.	1·0 grams.
	Aquæ dest.	40·0 „

S. : Emetic ; half to be taken at once, and the other half in five minutes, if necessary.

R	Magn. ust. in aq.	200·0 grams.
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D. S. : Tablespoonful every half-hour.

8. *Antimonial Preparations and Tartar Emetic.*

R	Acid. Tannic.	3·0 grams.
	Aquæ dest.	140·0 „
	Syr. Althææ	60·0 „

M. S. : Tablespoonful every five minutes.

9. *Arsenic Preparations.*

℞ Magn. ust. in aq. 200·0 grams.

D. S. : One-third to be taken at once, then a tablespoonful every five minutes.

10. *Atropia.*

℞ Fol. Jaborandi 10·0 grams.
Fiat infus. ad colat. 200·0 „

S. : Take half at once, then every half-hour a tablespoonful with a tablespoonful of wine. _____

℞ Pilocarpin. Mur. 0·05 grams.
Aque dest. 2·00 „

S. : Inject hypodermically.

11. *Baryta.*

Treat like lead salts.

12. *Belladonna.*

Treat like atropia.

13. *Bites by Dogs and Cats.*

℞ Potassæ 1·0 grams.
Aque dest. 500·0 „

M. S. : Wash the wound, and keep open with linen dipped into it, until a physician arrives.

14. *Snake Bite.*

See dog bite.

℞ Aquæ Ammon. 30 gtt.
Aque dest. 150·0 grams.
Syr. simpl. 30·0 „

M. S. : Tablespoonful every five minutes.

15. *Lead Salts.*

℞ Aquæ Laxat. 50·0 grams.
Magnes. Sulph. 30·0 „
Aque ferv. 100·0 „

M. S. : Give in two doses, within ten minutes.

16. *Bromine.*

℞ Magn. ust. in aqua 200·0 grams.

S. : Take one-third at once, then a tablespoonful every quarter of an hour.

17. *Brucia.*

Treat like strychnia.

18. *Cannabis Indica.*

Treat like morphia.

19. *Cantharidin.*

℞ Cupri Sulph.	. . . . .	1·0 gram.
Aquæ dest.	. . . . .	40·0 „

M. S.: Emetic; take one-half immediately, and the balance in five minutes, if necessary. Then :

℞ Camph.	. . . . .	8·0 grams.
Muc. g. Arabie	. . . . .	q. s.
Mist. Gummos.	. . . . .	300·0 grams.
Tr. Opii	. . . . .	10 gtt.

M. S.: Tablespoonful every five or ten minutes.

20. *Carbolic Acid.*

Use the same emetic as for anilin. Then :

℞ Magn. ust. in aqua	200·0 grams.
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S.: Take one-half at once, then every quarter of an hour a table-spoonful alternately with

Mist. Oleos.	200·0 grams.
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S.: Tablespoonful every quarter of an hour.

21. *Chloral Hydrate.*

℞ Atrop. Sulph.	2 milligram.
Aquæ dest.	. . . . .	35·0 grams.

M. S.: Give in two doses, in the course of half an hour. (Instead of atropia, tincture of belladonna, 2 grams, may be given in the same manner.

22. *Chloroform.*

℞ Aquæ Ammon.	50·0 grams.
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S.: For smelling. (Cold douche and ice applied to the head.)

℞ Two Scidlitz Powders.

S.: Give one. If very bad, give

℞ Cupr. Sulph.	. . . . .	1·0 gram.
Aquæ dest	. . . . .	40·0 „

S.: Emetic; give one-half, and, if necessary, the other half five minutes later.

23. *Chlorine Vapours.*

℞ Aquæ Laurocerasi 10·0 grams.
 Ætheris,
 Alcohol, 90 per cent. āā 40·0 „

S. : For smelling and inhaling.

℞ Spir. Nitr. dulc. 20·0 grams.
 Syr. Althææ,
 Aquæ dest. āā 40·0 „

M. S. : A tablespoonful every five or ten minutes.

24. *Chromic Acid and Chromates.*

℞ Pulv. Ferri 5·0 grams.
 Linct. Oleos,
 Syr. simpl. āā 50·0 „

M. S. : Shake well, and take a dessertspoonful every five minutes, and then two tablespoonfuls of water.

25. *Sulphuretted Hydrogen.*

℞ Spir. Ætheris comp. 30·0 grams.

S. : Give ten drops every five minutes in a dessertspoonful of water.

℞ Spir. Æth. Nitrosi 50·0 grams.

S. : Pour on a cloth, and apply to nostrils.

℞ Calc. Hypochlor. 40·0 grams.

S. : For smelling. (Fresh air ; wash with vinegar.)

26. *Codeia.*

See morphia.

27. *Colchicia.*

See aconitia.

28. *Conia.*

℞ Strych. Nitr 0·01 gram.
 Aquæ dest. 100·0 „
 Tr. Opii 30 gtt.

M. S. : Two dessertspoonfuls every quarter of an hour, until one-third is taken ; then every half-hour, until the second one-third is consumed ; then every hour.

29. *Curare.*

℞ Strych. Nitr.	0.05 gram.
Aquæ dest.	5.0 „

M. S. : Inject.

30. *Potassium Cyanide and Prussic Acid.*

℞ Cupri Sulph.	2.3 grams.
Aquæ dest.	28.0 „

Dissolve. S. : Emetic ; Tablespoonful at once, the balance in five minutes. (Cold water ought to be applied.)

31. *Digitalis.*

Like morphia.

32. *Muscaria.*

See chloral hydrate. Or :

℞ Atrop. Sulph.	0.01 gram.
Aquæ dest.	5.0 „

S. : Use as an injection.

33. *Gratiola.*

Like aconitia.

34. *Helleborus.*

See aconitia.

35. *Hyoscyamus.*

See morphia.

36. *Stings by Insects.*

℞ Aquæ Ammon.	20.0 grams.
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S. : Apply externally.

37. *Iodine.*

℞ Amyl.	5.0 grams.
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Mix by triturating with a little water ; then pour on

Aquæ Ferri	100.0 grams.
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and add

Magn. ust. in Aqua	100.0 grams.
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S. : Tablespoonful every five minutes.

38. *Lime.*

See caustic lime.

39. *Oxalic Acid and Oxalates.*

℞ Calcii Carb. pulv.	50·0 grams.
Aquæ dest.	200·0 „

M. D. S. : One-half at once; then every ten minutes a table-spoonful. Half an hour later take—

℞ Aquæ Laxat. Vienn.	50·0 grams.
Sodii Sulph. cryst.	10·0 „

Dissolve. S. : Take at once.

40. *Carbonic Oxide and Carbonic Acid Gas.*

℞ Aquæ Ammon.	40·0 grams.
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S. : For smelling. (Cold ablutions.)

℞ Extr. Ergotæ	0·30 gram.
Aquæ dest.	50·0 „

S. S. : Dessertspoonful every quarter of an hour.

41. *Creasote.*

℞ Pulv. Acaciæ	10·0 grams.
Ol. Amygd. dulc.	20·0 „
Aquæ dest.	230·0 „

Fiat emulsio. D. S. : Take one-fourth at once, then half a teacupful every ten minutes.

42. *Copper Salts.*

℞ Pulv. Ferri	14·0 grams.
Flor. Sulph. lot.	8·0 „
Syr. simpl.	60·0 „

M. D. S. : Shake well, and give a dessertspoonful every five minutes, alternating with

℞ Magn. Ust. in Aq.	200·0 grams.
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Mix with white of 4 eggs, and add

Aquæ dest.	200·0 grams.
Syr. simpl.	80·0 „

S. : Half a teacupful every five minutes.

43. *Swallowed Copper Money.*

To children :

℞ Hydrom. Infant.	20·0 grams.
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D. S. : Give at once.

To adults :

℞ Aq. Laxat. Vienn.	50·0 grams.
Sodii Sulph. cryst.	10·0 „

D. S. : Take at once.

44. *Lactucarium.*

As morphia.

45. *Mineral Acids.*

℞ Magn. Ust. in Aq.	200·0 grams.
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D. S. : Take one-half at once ; then a tablespoonful every five minutes, alternating with two tablespoonfuls of the following :

℞ Ol. Amygd. dulc.	. . . . .	20·0 grams.
Pulv. Acaciæ.	. . . . .	10·0 „
Aquæ dest.	. . . . .	200·0 „
Syr. simpl.	. . . . .	100·0 „

Fiat emulsio.

46. *Morphia.*

℞ Cupri Sulph.	. . . . .	1·0 gram.
Aquæ dest.	. . . . .	40·0 „

M. D. S. : Emetic ; give one-half, and, if necessary, the balance in five minutes. Besides :

℞ Coffeæ Tostæ	. . . . .	50·0 grams.
F. Infusum ad Colatur.	. . . . .	200·0 „
Acidi Tannici	. . . . .	4·0 „
Syr. simpl.	. . . . .	50·0 „

S. : Teaspoonful every five minutes.

47. *Nicotina.*

In cases of nausea in consequence of smoking.

℞ Aceti crudi	. . . . .	50·0 grams.
Aquæ dest.	. . . . .	200·0 „
Syr. simpl.	. . . . .	50·0 „

M. S. : One-half at once, and then a tablespoonful every five minutes.

In case of poisoning. (See morphia.)

℞ Acidi Tannici	. . . . .	4·0 grams.
Aquæ dest.	. . . . .	200·0 „
Syr. simpl.	. . . . .	50·0 „

M. D. S. : Tablespoonful every five minutes.

48. *Opium.*

Treat like morphia.

49. *Paris Quadrifolia.*

Like morphia.

50. *Phosphorus.*

℞ Cupri Sulph.	. . . . .	1·0 gram.
Aquæ dest.	. . . . .	40·0 „

D. S.: Emetic; give one-half, and, if necessary, the balance in five minutes. Then:

℞ Ol. Terebinth. Vetusti.	30·0 grams.
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(the older the better), beat with the white of 2 eggs, and add

Aquæ Ment. pip.	250·0 grams.
Syr. simpl.	. . . . .	50·0 „

Fiat emulsio. S.: Shake well, and give one tablespoonful every half-hour, until one-fourth of the mixture has been given; then one tablespoonful every hour.

In doubtful cases of poisoning with phosphorus give

℞ Magn. Ust. in Aqua	. . . . .	20·0 grams.
Aquæ Chlori.	. . . . .	120·0 „

M. D.

51. *Phosphorus—Burns.*

℞ Argenti Nitr. fus.	. . . . .	2·0 grams.
Aquæ dest.	. . . . .	20·0 „

Solve. S.: Apply with a camel-hair brush, and use as a wash.

52. *Pulsatilla.*

Treat like aconitia.

53. *Mercury Salts.*

See copper salts.

54. *Sabina.*

See morphia.

55. *Santonin.*

℞ Cupri Sulph.	. . . . .	1·0 gram.
Aquæ dest.	. . . . .	40·0 „

S.: Emetic; give one-half at once, and, if necessary, the balance in five minutes.

56. *Fungi.*

Like morphia.

57. *Ergot.*

Like sausage poison.

58. *Silver Preparations.*

℞ Sodii Chlorid.	. . . . .	20.0 grams.
Aquæ Comm.	. . . . .	300.0 „

M. D. S.: Give one-half at once, and then a tablespoonful every half-hour.

Between the doses give:

℞ Mist. Oleosæ,		
Mist. Gummosæ	. . . . .	5ā 150.0 grams.

M. S.: Two tablespoonfuls every half-hour.

59. *Stramonium.*

Like opium. Then:

℞ Morph. Mur.	. . . . .	0.10 gram.
Aquæ dest.	. . . . .	10.0 „

Inject hypodermically.

60. *Strychnia.*

℞ Acidi Tannici	. . . . .	3.0 grams.
Aquæ dest.	. . . . .	140.0 „
Syr. Althææ	. . . . .	60.0 „

M. D. S.: Tablespoonful every five minutes.

℞ Chlorat. Hydrat.	. . . . .	4.0 grams.
Aquæ dest.	. . . . .	100.0 „

Solve. S.: Tablespoonful every half-hour.

61. *Veratria.*

Treat like morphia.

62. *Sausage Poison, or Spoiled Meat.*

℞ Cupri Sulph.	. . . . .	1.0 grams.
Aquæ dest.	. . . . .	40.0 „

S. D. S.: Emetic; give one-half at once, and, if necessary, the balance in five minutes. Then give:

℞	Ætheris pur.	. . . . .	2·0	grams.
	Aquæ dest.	. . . . .	150·0	„
	Tr. Opii	. . . . .	10	gtt.
	Syr. Capill. Vener.	. . . . .	20·0	grams.

S.: Tablespoonful every half-hour.

63. Zinc Salts.

℞	Acidi Tannici	. . . . .	4·0	grams.
	Aquæ dest.	. . . . .	140·0	„
	Syr. Althææ.	. . . . .	60·0	„

D. S.: Tablespoonful every five minutes.

64. Tin Salts.

℞	Pulv. Ipecac.	. . . . .	2·0	grams.
	Aquæ dest.	. . . . .	100·0	„
	Syr. simpl.	. . . . .	20·0	„

M. D. S.: Emetic; to be taken in two doses within a quarter of an hour. Then:

℞	Magn. Ust. in Aqua	200·0	grams.
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S.: Take one-third at once, then a tablespoonful every five minutes, besides plenty of milk.

65. Petroleum, or Volatile Oils.

℞	Mixt. Oleos.	1000·0	grams.
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S.: Drink continually.

The following are the formulæ of several of the preparations ordered above:—

Aqua Laxativa Viennensis.

Nearly identical with Infus. Sennæ comp., Ph. Germ.

℞	Senna	6	parts.
	Hot water	48	„

Infuse for half an hour, strain and add—

Manna	8	parts.
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Hydromel Infantum.

℞	Vienna draught	3	parts.
	Syrup of Manna	1	„

Linctus Oleosus.

R	Acaciæ Pulv.	1 part.
	Aquæ Amygd. Amar. dil.,	
	Ol. Amygd. expres.	āā 2 parts.
	Syr. Althææ	3 „

M.

Magnesia Usta in Aqua.

R	Magnesia	1 part.
	Water	6 „

Harmlessness of Copper Salts. M. Galippe. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 237.) The author has shown in a previous report that the prolonged administration of small doses of copper salts (taken with the food) fails to produce any symptoms of poisoning. Subsequently, Burg and Ducom have made experiments on dogs with results leading to the same conclusion. Recently the author has experimented on himself and others, without being able to notice any injury to health.

Solubility of Gun-Cotton in Various Liquids. M. Barcy. (*Polyt. Notizbl. and Pharm. Zeitschr. für Russland*, from *New Remedies*.) The author has experimented with various other solvents besides a mixture of alcohol and ether, to produce a suitable solution of gun-cotton for photographic purposes.

Acetone, a very volatile liquid (boils at 56° C.), and soluble in all proportions of water, is one of the best known solvents of gun-cotton. It shares with the usual ether-alcohol the property that it dissolves the hot-prepared almost pulverulent variety of gun-cotton more readily than that prepared at low temperatures. On pouring a solution of gun-cotton in acetone into water, the gun-cotton is precipitated in the form of large white flakes, which do not coalesce, and may be easily washed. After drying, 3 grams of this gun-cotton occupy a space of almost 200 c.c. It is not necessary to use absolutely pure acetone; if the latter, on being poured into water, does not produce a milkiness, and does not reduce silver salts, it is sufficiently pure.

Methylic alcohol is another good solvent. This should be soluble in all proportions in water, and have no effect on silver salts. A solution of gun-cotton in this menstruum is more gelatinous than that produced with acetone. On pouring it rapidly into water, a compact gelatinous mass is produced, which can be washed only with difficulty. If, however, the solution is poured into cold water in a very thin stream, a very voluminous mass results (25 grams occupy

the space of 2 litres), which may be easily washed. On drying, the mass becomes horny, semi-transparent, and amber-coloured. It is easily soluble in ether-alcohol.

Glacial Acetic Acid is also a good solvent of gun-cotton. The solution poured into water behaves like that made with acetone. On drying, every trace of acetic acid volatilizes.

Ultramarine. A. Rinne. (*Ber. der deutsch. chem. Ges.*, xii., 1323-1326. From *Journ. Chem. Soc.*) In the preparation of ultramarine, the product obtained from the same mixture of ingredients may vary in colour from green to deep blue.

If the different samples are washed with water, and the amount of sodium sulphate determined in the liquid, it will be found that the sodium sulphate increases with the intensity of the blue: *e.g.* from green ultramarine, 2.41 per cent. Na_2SO_4 , and from blue ultramarine, 6.87 per cent. Na_2SO_4 —were obtained.

The amount of sulphuretted hydrogen evolved when the ultramarine is treated with an acid is less for blue than for green ultramarine; green = 1.96, blue 0.22 per cent. S. Since ultramarine contains sodium thiosulphate and sulphite, these numbers do not prove that the blue ultramarine contains but a very small quantity of sodium sulphide; they merely indicate that the sulphuretted hydrogen evolved from the decomposition of the sodium sulphide is almost completely destroyed by the sulphurous anhydride which is liberated from the sulphur oxy-acids.

The author regards ultramarine as a sodium-aluminium silicate, in which varying quantities of sodium sulphide and the sodium salts of sulphur oxy-acids are dissolved.

Examination of Mineral Lubricating Oils. Dr. O. Brenken. (*Zeitschrift für analyt. Chemie*, xviii., 546. From *Chem. News.*) The author determines—1, the specific gravity; 2, the temperature at which inflammable and continuously combustible gases are evolved. For this purpose he heats the oil on the sand-bath in a crucible 6.4 c.m. wide and 4.7 in depth, filled to 1.2 c.m. from its edge, and after the experimental temperature has been attained he removes it from the sand-bath and passes a small gas flame over it, as in Hannemann's petroleum-test, trying it first from 5 to 5 degrees, and afterwards from 2 to 2. Oils which foam strongly when heated are unfit for many purposes. He observes, further:—3, the point of congelation; 4, the undissolved constituents on dissolving 10 c.c. in an equal volume of ether, filtering and weighing the washed residue; 5, the reaction with soda-lye of sp. gr. 1.40: 10 c.c. of the oil are well shaken up with 5 c.c. of the soda-lye and heated in the boiling

water-bath. After repeated shaking the lye must remain clear, and its volume must not be altered. The test tube used in this experiment must be absolutely free from grease. 6. The reaction with nitric acid of sp. gr. 1.45 : on agitating equal volumes no rise of temperature, or but a very slight one, should be perceptible. This test shows the absence of tar-oils. 7. Reaction with sulphuric acid, sp. gr. 1.53 : equal volumes are shaken up and heated in the water-bath, when the acid should take merely a pale-yellow colour. A brown or black coloration shows imperfect refining, or, along with No. 6, the presence of tarry oils. 8. Behaviour on shaking with water : the water must remain clear, free from a whitish turbidity, and should not have an acid reaction.

A Brilliant Purple for Show Bottles. (*Canad. Pharm. Journ.*)

Sulphate of Copper	2 drachms.
Water	2 ounces.
French Gelatine	1 drachm.
Boiling Water	2 ounces.
Solution of Potash	2 pints.

Dissolve the copper salt in the water and the gelatine in the boiling water. Mix the two solutions and add the liquor potassæ. Shake the mixture a few times during ten hours, after which decant and dilute with water.

Ink for Writing on Sheet Tin. C. Bernbeck, in the *Pharmaceutische Zeitung*, recommends the following :—

Sulphate of copper (1 gram) is dissolved in 20 grams of water, 2 drops of hydrochloric acid are added, and sufficient solution of gum arabic to make the ink adhesive. This ink writes intensely black, and is very durable. It must be written with copper pens. The addition of a little pyrogalllic acid is advantageous, because the writing appears at once, which is not the case with the simple copper solution.

The Editor of *New Remedies* gives the following formula :—

A jet-black, lustreless ink, or rather varnish, for writing on sheet tin, which is absolutely insoluble in water, and dries instantly, may be prepared by dissolving shellac in alcohol (2 ounces in 1 pint), filtering with the aid of chalk, and mixing with finest lamp-black.

Incidentally, it may be remarked that a turpentine solution of shellac with lamp-black produces on drying, a *glossy* black. On the other hand, an alcoholic solution produces a perfect *dead* black, without a trace of lustre.

Logwood Copying Ink. M. Fehr. (From *Pharm. Centralhalle*.)
35 grams of logwood extract are dissolved in 1000 grams of boiling

vinegar, and 20 grams of sulphate of iron, 10 grams of alum, 16 grams of gum arabic, 32 grams of sugar, and 2 grams of glycerin added to the cooled solution.

Removal of Nitrate of Silver Stains. Dr. H. Kaetzer. (*Pharm. Zeitung*, 1879, 767.) In the place of the very poisonous potassium cyanide, the author recommends a solution of 10 grams of bichloride of mercury, and the same quantity of chloride of ammonium, in 100 grams of distilled water. This solution readily removes silver stains from the skin, and also from linen or cotton without injuring the fabric.

Improved Process for Bleaching Animal Tissues. (From *Zeitschr. des oesterr. Apoth. Ver.*) The substances to be bleached are first immersed in a strong solution of potassium permanganate, then placed in a solution of sodium bisulphide, and afterwards washed with water. This process is both rapid and efficient.

Sulpho-Methylate of Soda: A New Purgative. M. Rabuteau. (*Chicago Pharm.*, April, 1880, from *Le Praticien*.) The author has investigated a new purgative, analogous to sulpho-vinate of soda. It is obtained by treating methyl alcohol with sulphuric acid, when methyl sulphuric acid and water are obtained. This product is neutralized with carbonate of barium, when the excess of sulphuric acid is thrown down in the insoluble form of barium sulphate, and there remains in solution sulpho-methylate of baryta, a substance which is very soluble, and which can be crystallized. It is then treated afresh with sulphuric acid, which yields sulpho-methylate of soda when neutralized with soda. The salt is white and very soluble, crystallizing with difficulty, of a feeble taste comparable to that possessed by sulpho-vinate of soda, with a sweet after-taste. Unfortunately it decomposed very rapidly into sulphate of soda and methylic products of a slight garlic-like odour. Ten grains of the salt in 6 drachms of water injected into the veins of a dog produced constipation. Acting upon the observation that the substance, when introduced into the blood, gave rise to constipation, the author believed that it should act as a dialytic purgative when given by the mouth. He therefore administered it to two patients: in one case a woman took 15 grams in two doses, when it produced three stools, of which two were copious; in the second, a man took eighteen grams, resulting in two stools without colic. The taste of the purgative is hardly perceptible, but it is difficult to preserve it.

An Improved Formula for Chlorodyne. R. de Puy. (*Canad. Pharm. Journ.*, May, 1880.) The formula for preparing chlorodyne adopted by the American Pharmaceutical Association yields a

very unpharmaceutical mixture, and, when tried, has failed to give satisfaction. By substituting glycerin for syrup, the author obtains a much more satisfactory preparation, which, if the extract of liquorice be of good quality, does not separate. It is as follows:—

Purified Chloroform	4 fl. oz.
Ether (720)	1 „ „
Alcohol	4 „ „
Molasses	4 „ „
Ext. Liquorice, B.P.	2½ troy oz.
Morphia Hydrochlorate	8 grains.
Oil of Peppermint	16 minims.
Glycerin	17½ fl. oz.
Acid Hydrocyanic, 2 per cent.	2 „ „

Dissolve the morphia and oil of peppermint in the alcohol, and mix the chloroform and ether with this solution. Mix the extract of liquorice with the molasses by applying a gentle heat, allow to cool, and add the glycerin. Shake these two mixtures together, and lastly add the hydrocyanic acid, and again shake well.

Fluid Meat. M. Rubner. (*Zeitschr. für Biologie*, 1879, 485.) The preparation sold under this name is represented to contain all the nutritious constituents of the meat, except the fat, in a fluid condition, the albuminoids of the meat having been converted into peptone. It is brown, of the consistence of a syrup, and has an odour resembling that of extract of meat.

The author has analysed this preparation, along with extract of meat, and meat itself, and publishes the following results:—

	Fluid Meat.		Meat.	Extract of Meat.
Water	20.79		75.90	21.70
Dry Residue	79.21		24.16	78.30
Calculated on the Dry Residues.	After Deducting the Na Cl.			
Total Nitrogen	10.36	11.86	14.10	10.25
Alcoholic Extract	43.30	49.54	6.66	70.39
Ash	18.64	6.90	5.89	22.36
Total Organic Matter	81.36	93.10	94.62	77.64
Organic Nitrogen	12.73	12.73	14.91	13.21

The author calculates that in order to introduce 80 grams of albumen or a corresponding amount of peptone within twenty-four hours, it would require a daily consumption of not less than 336 grams of fluid meat.

Formulae for Increasing and Decreasing the Strength of Liquids to any Desired Degree. E. Claassen. (*New Remedies*, March, 1880.)

I. Given a liquid of known weight and percentage. Required to know the quantity of a liquid of the same kind, of higher or lower percentage, or of water, which will have to be added to produce a desired *percentage*.

Let a be the quantity of the given liquid,

b its percentage of important constituent,

c the percentage of the liquid to be mixed with a ,

d the desired percentage of the mixture,

x the quantity of the liquid, of higher or lower percentage, or the quantity of water, to be added to a ;

1. Then we have $x = \frac{a(b-d)}{d-c}$ if the liquid to be added is of higher or lower percentage, or in words:—

To find x (the quantity of liquid to be added), multiply the difference between the percentage of the liquid a , and the desired percentage of the mixture, by the quantity of the liquid a , and divide the product by the difference between the desired percentage and that of the liquid to be mixed with a .

Example: Supposing we have 40 parts of a liquid of 50 per cent., and want to mix it with a liquid of 20 per cent., in order to get one of 30 per cent., how much of the liquid of 20 per cent. must be added?

$$x \text{ (the quantity of the liquid of 20 per cent.)} = \frac{40 (50 - 30)}{30 - 20} = \frac{40 \times 20}{10} = 80.$$

2. $x = \frac{a (b-d)}{d}$, if water must be added, or in words:—

To find x (the quantity of water to be added), proceed as described under 1, but divide the product by the desired percentage only.

Example: Supposing we have 40 parts of a liquid of 50 per cent., and want to mix it with water, in order to get one of 30 per cent. how much water must be added?

$$x \text{ (the quantity of water)} = \frac{40 (50 - 30)}{30} = \frac{40 \times 20}{30} = \frac{800}{30} = 26\frac{2}{3}$$

II. Given two liquids of the same kind, one of higher and the other of lower percentage; or one of any percentage, and the other being water. Required to know the quantity of the weaker liquid to be added to the stronger to produce a desired *weight and percentage*.

Let a be the desired weight or quantity of the mixed liquids,
 b the percentage of the stronger liquid,
 c the percentage of the weaker liquid,
 d the percentage of the mixture,
 x the weight of the weaker liquid, or of water, to be added to the stronger.

Then we have:—

1. $x = \frac{a(b-d)}{b-c}$, if a stronger liquid is to be mixed with a weaker one; or in words:

To find x (the quantity of the weaker liquid), multiply the difference between the percentage of the stronger liquid and the desired percentage of the mixture, and divide the product by the difference between the percentage of the stronger and that of the weaker liquid.

Example: Supposing we have a liquid of 60 per cent., and another of 20 per cent. We want 40 parts of a liquid of 30 per cent. How much of the liquid of 20 per cent. must be taken?

$$x \text{ (the quantity of the weaker liquid)} = \frac{40(60-30)}{60-20} = \frac{40 \times 30}{40} = 30$$

Then the quantity of the stronger liquid will be 10 parts, to make the desired 40 parts.

2. $x = \frac{a(b-d)}{b}$, if a stronger liquid must be mixed with water; or in words:—

To find x (the quantity of water to be added) proceed as described under II., 1, but divide the product by the percentage of the stronger liquid only.

Example: Supposing we have a liquid of 60 per cent. We want 40 parts of a liquid of 30 per cent. How many parts of water must be taken?

$$x \text{ (the quantity of water)} = \frac{40(60-30)}{60} = \frac{40 \times 30}{60} = 20$$

That is, 20 parts of water must be mixed with 20 parts of the given liquid.

A Good Clarifying Liquid. (*Canad. Pharm Journ.*)

Albumen	300 parts.
Neutral Tartrate of Potash	2 „
Alum	5 „
Sal Ammoniac.	700 „

The albumen must not, of course, be coagulated. The ingredients are first dissolved in a little water, and then added to the liquid to be clarified.

Note on Unguentum Plumbi Subacetatis. C. Bernbeck. (*Pharm. Zeitung*, 1879, 465.) The author finds that this ointment, unless freshly made, always contains free acetic acid, and that the liberation of this acid is noticeable even if the ointment is but a few days old. In his opinion, the ointment ought to be freshly prepared whenever it is wanted, as otherwise it will produce irritating instead of cooling effects.

Unguentum contra Favum Capitis. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 138.) The ointment made according to the following formula is perfectly harmless, and may therefore be safely applied to the heads of children of any age.

℞ Acidi salicylici	10·0 parts.
Boracis	3·3 „
In pulverem tenerrimum redacta commisce cum	
Ceræ flavæ	50·0 „
Adipis suillæ	250·0 „
antea liquata et pigmento rubro Alkannæ tinctæ.	
Tum adde	
Balsami Peruviani	10·0 „
Olei Bergamottæ	50 gtt.
Olei Anisi stellati	20 gtt.
deinde paullatim	
Aquæ Rosæ	30·0 parts.
Agita, donec massa unguentaria plane refrigerit.	

Lip-Salve. (From *New Remedies*.)

Spermaceti	40 parts.
Lard, perfectly pure and fresh	80 „
White Wax	20 „
Oil of Sweet Almonds	5 to 10 „

according to the season of the year, are melted together, the mixture coloured with a sufficient quantity of alkanet, by digesting the root with the melted mass, and the latter then suitably perfumed, for instance, with

Oil of Bergamot	2 parts.
Oil of Orange	3 „

The mass is then poured into moulds. It is customary to pour it into tin tubes, from which it is removed when cold, and then covered with tinfoil.

Cold Cream (Crème celeste).

1. Spermaceti	30 parts.
White Wax	24 „
Oil of Sweet Almonds	168 „

are melted together at a gentle heat, the melted mass poured into a warmed porcelain or wedgewood mortar, stirred until it begins to solidify, and then intimately mixed with

Rosewater	70 parts.
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After stirring until cold, there may be added, for every 10 ounces of the mixture,

Oil of Rose	2 drops.
Oil of Bitter Almonds	3-4 „

This cream is white. The following formula yields a cheaper, slightly yellow, but still very good product:—

2. White Wax	166 parts.
Olive Oil, finest	500 „
Rosewater	100 „
Oil of Bergamot	15 „
Oil of Bitter Almonds	q. s.

To be prepared as the preceding.

Glycerin Cream (Crème de Glycerine).

Spermaceti	60 parts.
White Wax	30 „
Oil of Sweet Almonds	250 „
Rosewater	10 „
Glycerin	20 „

To be prepared like cold cream, and to be perfumed with oil of rose and oil of bitter almonds.

Almond Cream (Crème d'Amandes).

Lard, perfectly pure and fresh	220 parts.
Solution of Potassa, containing 26 per cent. of caustic potash	120 „
Alcohol, 60 per cent.	10 „
Oil of Bitter Almonds	q. s.

Triturate, in a porcelain or wedgewood mortar, the lard and potassa solution, and let it stand a few hours. Then add the alcohol and sufficient oil of bitter almonds to give it the proper flavour. Finally triturate until the mass is uniform, and resembles mother-of-pearl.

This cream has a handsome look, but is not so bland as the first-mentioned varieties.

Tooth Wash. Dr. W. Myers. (From *New Remedies*.) Take 16 grams of quillaya saponaria (soap-bark) in coarse powder, add 100 c.c. alcohol and 150 c.c. aqua destillata, macerate for ten days and filter; then add 0.5 gram cochineal dissolved in 125 c.c. aque menthæ piperitæ, also 2 c.c. ol. gaultheriæ rubbed up with 50 c.c. glycerin; finally, sufficient distilled water to make the whole three-quarters of a litre.

A few drops on a toothbrush previously dipped in water will, when rubbed on the teeth, produce a rich lather; it cleanses thoroughly, and is also an excellent remedy for soft gums, which it hardens in a short time. It is fragrant and agreeable to use.

Extract of Ylang-Ylang. (*Canad. Pharm. Journ.*)

True.

Extract of Jasmine	8 ounces.
„ Rose	16 „
Tincture of Orris Root	8 „
„ Civet	4 „
Oil of Ylang-Ylang	4 drachms.
Alcohol	2 pints.

Artificial.

Tincture of Tonka Beans	3 ounces.
„ Musk	4 „
Extract of Tuberose	4 „
„ Cassia	4 „
Tincture of Orris Root	8 „
Oil of Orange (fresh)	2 drachms.
Neroli	$\frac{1}{2}$ drachm.
Alcohol, sufficient to make	4 pints.

Florida Water. (*Chicago Pharm.*, February, 1880.) The two following formulæ are recommended for this favoured cosmetic in the *Boston Journal of Chemistry* :—

1.

Oil of Bergamot	4 ounces.
„ Lemon	6 „
„ Lavender	1 ounce.
„ Cloves	6 drachms.
Alcohol (wine measure)	3½ gallons.
Water „	6 pints.

The oils and alcohol must be mixed and allowed to stand a day or two, after which the water should be carefully added.

2.

Oil of Bergamot	8 ounces.
„ Orange	4 „
„ Lavender	3 „
„ Cloves	1½ „
„ Cinnamon (true)	¼ ounce.
Tincture of Orris	½ pint.
„ Peru Balsam	¼ „
Alcohol	4 gallons.
Water	6 pints.

Mix, and let it remain quiet for some days before filtering and bottling.

New Formulæ for Boquets. G. Dubelle. (*New Remedies*, February, 1880.)

Victoria Regia.

Extract of Tuberose	20 fl. oz.
„ Jasmin	16 „
„ Neroli,	
„ Rose,	
„ Acacia Flowers	each 4 „
„ Vanilla	3 „
Essence of Civet	1 „
Oil of Bergamot	1 „
„ Bitter Almonds	5 drops.

Alpine Rose.

Essence Bouquet	16 fl. oz.
Triple Extract of Rose,	
Extract of Jasmin,	
„ Reseda	each 12 „
Essence of Ambergris	4 „
„ Civet	2 „

H.M.S. Pinafore Bouquet.

Triple Extract of Rose	16 fl. oz.
Extract of Violets	12 „
„ Neroli	8 „
„ Musk	1 „
Oil of Bergamot	¼ „
„ Citron	½ „
„ Cardamom	40 drops.
„ Melisse	20 „
„ Coriander,	
„ Thyme	each 10 „

Flowers of Eden.

Triple Extract of Night-blooming	
Cereus	16 fl. oz.
Triple Extract of Lily of the Valley . .	14 „
„ „ Spring Flowers,	
„ „ Ylang-Ylang,	
Eau de Millefleurs	each 12 „
Essence of Musk	2 „

Flowers of Love.

Triple Extract of Rose	16 fl. oz.
Extract of Jasmin	14 „
„ Acacia Flowers	12 „
„ Orange Flowers,	
„ Tuberose,	
„ Hyacinth	each 4 „
„ Jonquil,	
„ Vanilla	each 2 „
Essence of Ambergris	1½ „

Rose of the East.

Triple Extract of Rose	16 fl. oz.
Extract of Mossrose	12 „
Oil of Sandal,	
„ Geranium Rose	each ½ „
„ Ylang-Ylang	1½ „

Floriline Bouquet.

Triple Extract of Rose	16 fl. oz.
Extract of Tuberose,	
„ Violets	each 8 „
„ Heliotrope	4 „
„ Orange Flowers,	
„ Verbena	each 3 „
Essence of Musk,	
„ Ambergris	each 2 „
Oil of Bergamot	1 „

Modjeska Bouquet.

Extract of Jonquil,	
„ Reseda,	
„ Tuberose	each 16 fl. oz.
„ Cassia Flowers,	
„ Violets	each 12 „
Essence of Musk	2 „
Oil of Bergamot,	
„ Ylang-Ylang	each ½ „
„ Otto Rose,	
„ Lavender	each ¼ „

Application of Chloride of Methyl for the Extraction of Perfumes.

C. Vincent. (From *Monit. Scientif.*; *New Remedies*, June, 1880.) The author has made successful experiments, on a large scale, in utilizing chloride of methyl for the extraction of perfumes from flowers and other parts of vegetable substances. Since this liquid has a very low boiling point, the odorous principles are not injured. By extracting the crude substance in a closed apparatus there is obtained a mixture of fat, wax, and essential oil, from which the latter may be extracted completely by alcohol. Chloride of methyl, to be applicable for this purpose, must be previously treated with concentrated sulphuric acid, to deprive it of an accompanying substance having a bad odour.

Transparent Glycerin Soap. (*Pharm. Zeitung*, 1879, 719.) A very good transparent glycerin soap may be prepared as follows:—Melt together 500 parts of suet, the same quantity of Ceylon cocoa oil, 250 parts of castor oil, 50 parts of palm oil, and 500 parts of glycerin, and saponify the mixture at about 75° C. with 650 parts of soda lye of 1·38 sp. gr. The soda solution should be added gradually, and the whole well stirred during the saponification, which will be completed in about five minutes. The soap is now removed from the source of heat, and mixed with 600 parts of strong alcohol, the whole being well stirred until it is clear, after which 150 parts of simple syrup are added, together with the perfumes. It is then poured into moulds.

Euphorbium as a Protective of Iron and Steel. (*Scientific American Suppl.*) Some years ago, at Natal, some of the labourers belonging to the colonial government, during the progress of their work, remarked that certain plants belonging to the natural order *Euphorbiaceæ*, when cut with an iron or steel tool, left a very adhesive coating of gum on the metal, and very difficult of removal. And they also discovered that a metallic surface covered with this material was no longer subject to rust. This observation led to experiments to ascertain whether gum euphorbium could not be utilized in a practical way for the preservation of metals generally. Plates of iron were, therefore, coated with the substance and immersed in the waters of Southern Africa, which are well-known for their deleterious action and for the rapidity with which vegetation develops in them. *Euphorbia* grows at Natal, very near the coast, so that nothing was more convenient and easier to ascertain than the fact as to whether the gum from the plant possessed the qualities attributed to it; whether it really would prevent iron from being corroded by sea water and attacked by vegetation. These

experiments having proved a success, an effort was made to ascertain whether a practical application could be made of the discovery. With this object gum euphorbium was dissolved in alcohol, and it was found that in this way an easy means was obtained for coating the hulls of ships, and the surface of all metals needing this mode of preservation. The alcohol on evaporation leaves the surface coated with a clean, hard coating of the gum. The first experiments were pursued yet further; plates of iron coated with the gum were sunk in the water at the Chatham docks, where everything quickly corrodes or decays. At the end of a couple of years it was found, on examination, that the iron was perfectly clean, and had undergone no corrosion whatever. In Africa the same substance has been experimented with successfully as a preventative of the attacks of white ants. Success in this case is attributed to the bitterness of the gum, which prevents the insects from perforating substances coated with it. It is said that this new preservative is now being introduced into England. In addition to the other properties attributed to it, it may be stated that it gives quite a lustre to objects covered with it, and also preserves them against the action of the atmosphere.

Gold Lacquer for Brass. (From *Pharmaceut. Zeitung*.) This is applied upon the metallic surface, previously scoured and perfectly clean, and at once heated with an alcohol flame, so as to melt the ingredients of the lacquer. A good recipe for such lacquer is the following :—

Shellac 200, sandarac 80, mastic 80, gamboge 20, dragon's blood 20, annatto 20, Venice turpentine 60, red saunders 30, alcohol 1000 parts. Digest and filter.

Another formula :—Shellac 10, mastic 1, sandarac 1, powdered aloes 2, powdered turmeric 5, powdered saffron $\frac{1}{2}$, dragon's blood 1, Venice turpentine $\frac{1}{2}$, alcohol 100 parts. Digest and filter. The articles to be lacquered are freed from dirt and deprived of grease, if necessary, by means of ether, then dried and heated to 30–35° C. (= 86–95° F.), quickly varnished over with a fine brush, and once more exposed to a somewhat higher temperature. The lacquer must not be applied too thick.

Another :—Sandarac 12, mastic 6, copaiva 2, Venice turpentine 3, oil of turpentine 4, absolute alcohol 36 parts. Mix this varnish with an equal weight of a filtered solution of shellac 5, dragon's blood 5, alcohol 50 parts.

Another :—Shellac 2, sandarac 4, elemi 4, alcohol 40 parts. Dissolve and filter. Mix the filtrate with an alcoholic tincture of gam-

boge and dragon's blood (or an alcoholic solution of fuchsine, picric acid, coralline, etc.), until the desired shade of colour is obtained.

The Use of Glue. (From the *Druggists' Circular and Chemical Gazette*.) Every one, almost, can use glue in a fashion, but few know how to apply it so as to obtain all its advantages. Pieces of wood carelessly glued together will come apart under the slightest strain, while the same cementing material, applied as it should be, will hold the pieces together so tenaciously, that if a fracture occur, it will be at a new place and not at the joint. The *Workshop Companion* gives the following practical and useful directions for the selection of glue and its proper application. It says:—

Good glue is hard, clear (not necessarily light-coloured, however), and free from bad taste and smell. Glue which is easily dissolved in cold water is not strong. Good glue merely swells in cold water, and must be heated to the boiling point before it will dissolve thoroughly.

Good glue requires more water than poor, consequently one cannot dissolve six pounds of good glue in the same quantity of water you can six pounds of poor. If good, the glue will break hard and tough, and when broken will be irregular on the broken edge. If poor, it will break comparatively easy, leaving a smooth, straight edge.

In dissolving glue, it is best to weigh the glue, and weigh or measure the water. If this is not done there is a liability of getting more glue than the water can properly dissolve. It is a good plan, when once the quantity of water that any sample of glue will take up has been ascertained, to put the glue and water together at least six hours before heat is applied, and if it is not soft enough then, let it remain longer in soak, for there is no danger in good glue remaining in pure water, even for forty-eight hours.

From careful experiments with dry glue immersed for twenty-four hours in water at 60° F., and thereby transformed into a jelly, it has been found that the finest ordinary glue, or that made from white bones, absorbs twelve times its weight of water in twenty-four hours; from dark bones the glue absorbs nine times its weight of water; while the ordinary glue, made from animal refuse, absorbs but three to five times its weight of water.

Glue, being an animal substance, must be kept sweet; to do this it is necessary to keep it cool after it is once dissolved, and not in use. In all cases keep the glue kettle clean and sweet by cleansing it often. Great care must be taken not to burn glue, and, therefore, it should always be prepared in a water-bath.

Carpenters should remember that fresh glue dries more readily than that which has been once or twice melted.

The advantage of frozen glue is that it can be made up at once, on account of its being so porous. Frozen glue of same grade is as strong as if dried.

If glue is of first-rate quality, it can be used on most kinds of wood work very thin, and make the joint as strong as the original. White glue is only made white by bleaching.

Liquid Glue.—1. A very strong glue may be made by dissolving 4 ounces of glue in 16 ounces of strong acetic acid by the aid of heat. It is semi-solid at ordinary temperatures, but needs only to be warmed, by placing the vessel containing it into hot water, to be ready for use.

2. Dilute officinal phosphoric acid with 2 parts, by weight, of water, and nearly saturate with carbonate of ammonia; dilute the resulting liquid, which must be still somewhat acid, with another part of distilled water, warm it on a water-bath, and dissolve it in enough glue to form a thick syrupy liquid. It must be kept in well-closed bottles.

3. A most excellent form is also *Dumoulin's Liquid and Unalterable Glue*. This is made as follows:—Dissolve 8 ounces of best glue in $\frac{1}{2}$ pint of water in a wide-mouthed bottle, by heating the bottle in a water-bath. Then add slowly $2\frac{1}{2}$ ounces of nitric acid, sp. gr. 1.330, stirring constantly. Effervescence takes place under escape of nitrous acid gas. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any moment. It does not gelatinize, or putrefy, or ferment. It is applicable to many domestic uses, such as mending china, wood, etc.

4. *Mouth Glue.*—Good glue, 1 pound; isinglass, 4 ounces. Soften in water, boil and add $\frac{1}{2}$ pound fine brown sugar; boil till pretty thick, and pour into moulds.

5. *Portable Glue.*—Put a piece of shredded gelatine into a wide-mouthed bottle; put on it a very little water, and about one-fourth part of glacial acetic acid; put in a well-fitting cork. If the right quantity of water and acid be used, the gelatine will swell up into worm-like pieces, quite elastic, but at the same time firm enough to be handled comfortably. The acid will make the preparation keep indefinitely. When required for use, take a small fragment of the swelled gelatine, and warm the end of it in the flame of a match or candle; it will immediately “run” into a fine clear glue, which can be applied at once direct to the article to be mended. The

thing is done in half a minute, and is moreover, done well, for the gelatine so treated, makes the very best and finest glue that can be had. This plan might be modified by dissolving a trace of chrome alum in the water used for moistening the gelatine, in which case, no doubt, the glue would become insoluble when set. But for general purposes there is no need for subsequent insolubility in glue.

Liquid Glue. (*Polyt. Notizblatt.* From *Chem. and Drug.*, May, 1880.) A solution of sugar in three parts of water, smeared on paper, possesses neither adhesiveness nor varnishing property. If slaked lime, equal to a fourth part of the sugar used, is added to the solution, warmed to 150° to 170° F., and macerated with frequent shaking for several days, the resulting thick solution, when poured off clear, resembles gum mucilage in glazing and adhesive power. If 3 parts of bruised glue are added to 12 or 15 parts of this solution, it quickly dissolves on warming, and the solution remains fluid when cold, without losing its adhesiveness, as happens when heated with acids. Glue can be dissolved in various proportions in this sugar solution, and always with improved adhesiveness. It can be used for almost every purpose, except when it will come in contact with colours destroyed by alkalies.

The following may be used as a working formula:—

Sugar	.	.	.	.	.	.	2 ounces.
Water	.	.	.	.	.	.	6 "
Slaked lime	.	.	.	.	.	.	$\frac{1}{2}$ "
Glue, broken small	.	.	.	.	.	.	$1\frac{1}{2}$ "

Dissolve the sugar in the water, add the lime, and heat nearly to boiling, macerate for several days, pour off the clear liquid, and add it to the glue. Heat moderately until dissolved.

Glycerin Cement. T. Morawski. (*Dingl. polyt. Journ.*, cccxxv., 213.) Litharge, ground with glycerol, forms a cement which hardens rapidly. The author found, under various conditions, a glyceride of lead in the form of fine needle-shaped crystals of the formula $C_3H_5PbO_3$; but much litharge usually remains uncombined. The combination takes place more rapidly on the water-bath. To prepare the compound quickly, a hot saturated solution of PbO in potash solution is mixed with glycerol, more PbO added to saturation, and the solution quickly filtered; occasionally the compound crystallizes out immediately. Heated to 130° , the compound becomes coloured, and at 200 – 210° it slowly carbonizes. Decomposition soon begins on boiling with water, glycerol and lead oxide being separated. It is easily soluble in acetic acid with decomposi-

tion, and potash-lye easily dissolves it, especially on warming. It is acted on by nitric and sulphuric acids, although not very rapidly when the acids are concentrated.

The greatest tenacity of the cement is obtained with 50 grams of litharge to 5 c.c. of glycerol.

The author is investigating compounds of glycerol and other metallic oxides.

Cements. (From the *Druggists' Circular*.) Quite as much depends upon the manner in which a cement is used as upon the cement itself. The best cement that ever was compounded would prove entirely worthless if improperly applied. The following rules must be rigorously adhered to if success would be secured :—

1. Bring the cement into intimate contact with the surfaces to be united. This is best done by heating the pieces to be joined in those cases where the cement is melted by heat, as in using resin, shellac, marine glue, etc. Where solutions are used, the cement must be well rubbed into the surfaces, either with a soft brush (as in the case of porcelain or glass), or by rubbing the two surfaces together (as in making a glue joint between two pieces of wood).

2. As little cement as possible should be allowed to remain between the united surfaces. To secure this the cement should be as liquid as possible (thoroughly melted if used with heat), and the surfaces should be pressed closely into contact (by screws, weights, wedges, or cords) until the cement has hardened.

3. Plenty of time should be allowed for the cement to dry or harden, and this is particularly the case in oil cements, such as copal varnish, boiled oil, whitelead, etc. When two surfaces, each half an inch across, are joined by means of a layer of white lead placed between them, six months may elapse before the cement in the middle of the joint has become hard. In such cases a few days or weeks are of no account; at the end of a month the joint will be weak, and easily separated, while at the end of two or three years it may be so firm that the material will part anywhere else than at the joint. Hence, where the article is to be used immediately, the only safe cements are those which are liquefied by heat, and which become hard when cold. A joint made with marine glue is firm an hour after it has been made. Next to cements that are liquefied by heat are those which consist of substances dissolved in water or alcohol. A glue joint sets firmly in twenty-four hours; a joint made with shellac varnish becomes dry in two or three days. Oil cements, which do not dry by evaporation, but harden by oxidation (boiled oil, white lead, red lead, etc.), are the slowest of all.

Aquarium Cement.—Litharge, fine, white, dry sand, and plaster of paris, each 1 gill; finely pulverized resin, $\frac{1}{3}$ gill. Mix thoroughly and make into a paste with boiled linseed oil to which drier has been added. Beat it well, and let it stand four or five hours before using it. After it has stood for fifteen hours, however, it loses its strength. Glass cemented into its frame with this cement is good for either salt or fresh water. It has been used at the Zoological Gardens, London, with great success. It might be useful for constructing tanks for other purposes, or for stopping leaks.

Casein Mucilage.—Take the curd of skim milk (carefully freed from cream or oil), wash it thoroughly and dissolve it to saturation in a cold concentrated solution of borax. This mucilage keeps well, and as regards adhesive power far surpasses the mucilage of gum arabic.

Casein and Soluble Glass.—Casein dissolved in soluble silicate of soda or potassa, makes a very strong cement for glass or porcelain.

Cheese Cement for Mending China, etc.—Take skim milk cheese, cut it in slices and boil it in water. Wash it in cold water and knead it in warm water several times. Place it warm on a levigating stone and knead it with quicklime. It will join marble, stone, or earthenware so that the joining is scarcely to be discovered.

Chinese Cement (Schio-liao). To three parts of fresh beaten blood are added four parts of slaked lime and a little alum; a thin, pasty mass is produced, which can be used immediately. Objects which are to be made specially water-proof are painted by the Chinese twice, or at the most three times. Dr. Scherzer saw in Peking a wooden box which had travelled the tedious road *viâ* Siberia to St. Petersburg and back, which was found to be perfectly sound and water-proof. Even baskets made of straw become, by the use of this cement, perfectly serviceable in the transportation of oil.

Pasteboard treated therewith receives the appearance and strength of wood. Most of the wooden public buildings of China are painted with schio-liao, which gives them an unpleasant reddish appearance, but adds to their durability. This cement was tried in the Austrian Department of Agriculture and by the "Vienna Association of Industry," and in both cases the statements of Dr. Scherzer were found to be strictly accurate.

Faraday's Cap Cement.—*Electrical Cement.*—Resin, 5 ounces; beeswax, 1 ounce; red ochre or venetian red, in powder, 1 ounce. Dry the earth thoroughly on a stove at a temperature above 212°. Melt the wax and resin together, and stir in the powder by degrees.

Stir until cold, lest the earthy matter settle to the bottom. Used for fastening brass work to glass tubes, flasks, etc.

Cement for Glass, Earthenware, etc.—Dilute white of egg with its bulk of water, and beat up thoroughly. Mix to the consistence of thin paste with powdered quicklime. Must be used immediately.

Glass Cement.—Take of pulverized glass, 10 parts; powdered fluorspar, 20 parts; soluble silicate of soda, 60 parts. Both glass and fluorspar must be in the finest possible condition, which is best done by shaking each, in fine powder, with water, allowing the coarser particles to deposit, and then to pour off the remainder, which holds the finest particles in suspension. The mixture must be made very rapidly by quick stirring, and when thoroughly mixed must be at once applied. This is said to yield an excellent cement.

Gutta-Percha Cement.—This highly recommended cement is made by melting together, in an iron pan, 2 parts of common pitch and 1 part gutta-percha, stirring them well together until thoroughly incorporated, and then pouring the liquid into cold water. When cold, it is black, solid, and elastic; but it softens with heat, and at 120° Fahr., is a thin fluid. It may be used as a soft paste or in the liquid state, and answers an excellent purpose in cementing metal, glass, porcelain, ivory, etc. It may be used instead of putty for glazing windows.

Iron Cement for Closing the Joints of Iron Pipes.—(1) Take of coarsely powdered iron borings, 5 pounds; powdered sal-ammoniac, 2 ounces; sulphur, 1 ounce; and water sufficient to moisten it. This composition hardens rapidly; but if time can be allowed, it sets more firmly without the sulphur. It must be used as soon as mixed, and rammed tightly into the joint.

(2) Take sal-ammoniac, 2 ounces; sublimed sulphur, 1 ounce; cast-iron filings or fine turnings, 1 pound. Mix in a mortar and keep the powder dry. When it is to be used, mix it with twenty times its weight of clean iron turnings or filings, and grind the whole in a mortar; then wet it with water until it becomes of convenient consistence, when it is to be applied to the joint. After a time it becomes as hard and strong as any part of the metal.

Kerosene Oil Lamps.—The cement commonly used for fastening the tops on kerosene lamps is plaster of paris, which is porous and quickly penetrated by the kerosene. Another cement, which has not this defect, is made with three parts of resin, one of caustic soda, and five of water. This composition is mixed with half its weight of plaster of paris. It sets firmly in about three-quarters of an hour.

It is said to be of great adhesive power, not permeable to kerosene, a low conductor of heat, and but superficially attacked by hot water.

Cement for Uniting Leather and Metal.—Wash the metal with hot gelatine, steep the leather in an infusion of nut galls (hot), and bring the two together.

Cement for Leather Belting.—One who has tried everything says, that after an experience of fifteen years he has found nothing to equal the following:—Common glue and isinglass, equal parts, soaked for ten hours in just enough water to cover them. Bring gradually to a boiling heat, and add pure tannin until the whole becomes ropy or appears like the white of eggs. Buff off the surfaces to be joined, apply this cement warm, and clamp firmly.

Litharge and Glycerine Cement.—A cement made of very finely powdered oxide of lead (litharge) and concentrated glycerine unites wood to iron with remarkable efficiency. The composition is insoluble in most acids, is unaffected by the action of moderate heat, sets rapidly, and acquires an extraordinary hardness.

Cement for Attaching Metal to Glass.—Copal varnish, 15; drying oil, 5; turpentine, 3. Melt in a water-bath, and add 10 parts slaked lime.

Paris Cement for Mending Shells and other Specimens.—Gum arabic, 5; sugar candy, 2; whitelead, enough to colour.

Porcelain Cement.—Add plaster of paris to a strong solution of alum till the mixture is of the consistency of cream. It sets readily, and is said to unite glass, metal, porcelain, etc., quite firmly. It is probably suited for cases in which large rather than small surfaces are to be united.

Soft Cement.—Melt yellow beeswax with its weight of turpentine, and colour with finely powdered venetian red. When cold it has the hardness of soap, but is easily softened and moulded with the fingers, and for sticking things together temporarily it is invaluable.

Soluble Glass Cements.—When finely pulverized chalk is stirred into a solution of soluble glass of 30° R. until the mixture is fine and plastic, a cement is obtained which will harden in between six and eight hours, possessing an extraordinary durability, and alike applicable for domestic and industrial purposes. If any of the following substances be employed besides chalk, differently coloured cements of the same general character are obtained:—1. Finely pulverized or levigated stibnite (grey antimony, or black sulphide of antimony) will produce a dark cement, which, after long burnishing with an agate, will present a metallic appearance. 2. Pulver-

ized cast iron, a grey cement. 3. Zinc dust (so-called zinc grey), an exceedingly hard grey cement, which after burnishing will exhibit the white and brilliant appearance of metallic zinc. This cement may be employed with advantage in mending ornaments or vessels of zinc, sticking alike well to metals, stone, and wood. 4. Carbonate of copper, a bright green cement. 5. Sesquioxide of chromium, a dark green cement. 6. Thénard's blue (cobalt blue), a blue cement. 7. Minium, an orange coloured cement. 8. Vermilion, a splendid red cement. 9. Carbon red, a violet cement.

Sorel's Cement.—Mix commercial zinc white with half its bulk of fine sand, adding a solution of chloride of zinc of 1.26 sp. gr., and rub the whole thoroughly together in a mortar. The mixture must be applied at once, as it hardens very quickly.

Steam Boiler Cement.—Mix two parts of finely powdered litharge with one part of very fine sand, and one part of quicklime which has been allowed to slake spontaneously by exposure to the air. This mixture may be kept for any length of time without injuring. In using it a portion is mixed into paste with linseed oil, or, still better, boiled linseed oil. In this state it must be quickly applied, as it soon becomes hard.

Turner's Cement.—Melt one pound of resin in a pan over the fire, and when melted, add a quarter of a pound of pitch. While these are boiling add brick-dust until, by dropping a little on a cold stone, you think it hard enough. In winter it may be necessary to add a little tallow. By means of this cement a piece of wood may be fastened to the chuck, which will hold when cool; and when the work is finished it may be removed by a smart stroke with the tool. Any traces of the cement may be removed from the work by means of benzine.

Wollaston's White Cement for Large Objects.—Beeswax, 1 ounce; resin, 4 ounces; powdered plaster of paris, 5 ounces. Melt together. To use, warm the edges of the specimen, and use the cement warm.

TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
SEVENTEENTH ANNUAL MEETING
AT
SWANSEA,
1880.

EDITED BY
PROFESSOR ATTFIELD, F.R.S.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*. * Authors are specially requested to send the titles of their Papers to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

Name)

(Address)

as a Member of the British Pharmaceutical Conference.

..... Member.

Date

This or any similar form must be filled up legibly, and forwarded to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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 Taplin, Mr. W. G., 75, Hampstead Road, N.W.
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 Taylor, Mr. E., St. George's Square, Droitwich.
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 Thomas, Mr. J., Bridge, Canterbury, Kent.

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 Thomas, Mr. J. E., 2, Christmas Street, Swansea.
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 Thomas, Mr. R., 143, High Street, Merthyr.
 Thomas, Mr. T. R., Barry Port.
 Thomas, Mr. W., Builth, Breconsnire.
 Thomas, Mr. W. J., 9, Commercial Place, Aberdare.
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 Thompson, Mr. G., Alston.
 Thompson, Mr. H., 101, Southwark Street, S.E.
 Thompson, Mr. H. A., 22, Worship Street, Finsbury Square, E.C.
 Thompson, Mr. J., 11, Aldersgate Street, E.C.
 Thompson, Mr. J., High Street, Knarlesboro', Yorkshire.
 Thompson, Mr. J. W., Bull Ring, Sedley, near Dudley.
 Thompson, Mr. Leonard, Barrgate, Richmond, Yorks.
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 Thornton, Mr. H., 136, Leeds Road, Bradford.
 Thornton, Mr. S., Beacon, Exmouth, Devon.
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 Tilsley, Mr. J., Berriew, Montgomeryshire, North Wales.
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 Tippet, Mr. B. M., 3, Sloane Street, S.W.
 Tipping, Mr. T. J. W., 155, High Street, Stoke Newington, N.
 Tipton, Mr. St. J., St. George's, Wellington, Salop.
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 Todd, Mr. T., Colinsburgh, N.B.
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 Toone, Mr. J. V., 14, New Bond Street, Bath.
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 Treweeks, Mr. R. H., Main Street, Pembroke.
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- Trim, Mr. E., 9, Wellington Terrace, Bournemouth, Hants.
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 Troake, Mr. R. J., 126, White Ladies' Road, Clifton, Bristol.
 Troake, Mr. W. H., Kingsbridge, Devon.
 Troke, Mr. C., 76, Laurel Grove, Penge, S.E.
 Trotman, Mr. A. C., 16, Cambridge Street, Hyde Park Square, W.
 Troughton, Mr. C., 72, Old Hall Street, Liverpool.
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 Tuck, Mr. G. F., Fore Street, Tiverton, Devonshire.
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 Turner, Mr. J., 15, Fore Street, Hexham.
 Turner, Mr. J., 16, Market Square, Aylesbury.
 Turner, Mr. J., 118, Princess Buildings, The Moor, Sheffield.
 Turner, Mr. R., Oundle, Northamptonshire.
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 Turner, Mr. T. Longton, North Staffordshire.
 Twaddle, Mr. R., 34, Maitland Street, Glasgow.
 Twemlow, Mr. R., 91, Upper Brook Street, Manchester.
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 Urwick, Mr. W. W., 60, St. George's Road, Pimlico, S.W.
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 Vance, Mr. W. N., Bray, Co. Wicklow.
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 Vennall, Mr. G., Cranleigh, Guildford.
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 Virgo, Mr. C., The Foregate, Worcester.
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 Wakeham, Mr. C., Helston.
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 Walker, Mr. T., Uddingston, near Glasgow.
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Walton, Mr. M. F., West End, Sowerby Bridge.
Walton, Mr. R., High Street, Maidenhead.
Wand, Mr. S., 18, Haymarket, Leicester.
Wand, Mr. T., 20, Layerthorpe, York.
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Ward, W., F.C.S., South Street, Sheffield.
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Warrior, Mr. H., Northallerton.
Warwick, Mr. D. H., Milbank Crescent, Hartlepool.
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Watson, Mr. M., 33, Prudhoe Street, Newcastle-on-Tyne.
Watson, Mr. T. D., 23, Cross Street, Finsbury, E.C.
Watson, W. H., F.C.S., F.R.M.S., Braystones, Beckermont, Carnforth.
Watts, Mr. C. C., Cliftonville, Brighton.
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Weston, Mr. C., 2, High Street, Ventnor, Isle of Wight.
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White, Mr. F., London Road, Nottingham.
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White, Mr. W., 15, Westgate, Bradford, Yorks.

- Whitfield, Mr. H., 45, High Street, Worcester.
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 Willan, Mr. W., 3, Friargate, Preston, Lancs.
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 Williams, Mr. J. T., Nelson Street, Swansea.
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 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williams, Mr. W., Llanfyllin.
 Williams, Mr. W. D., High Street, Hampstead, N.W.
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 Williams, Mr. W. J., 137, Cannon Street, E.C.
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 Willmott, Mr. W., King's College Hospital, W.C.
 Willmott, Mr. W., The Brewery, Sheffield.
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 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., Penrith, Cumberland.

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 Wilson, Mr. T. W., Bootham, York.
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 Woodhead, W. H., M.D., 58, Grosvenor Street, Manchester. [Rd., W.
 Woodland, J., F.L.S., F.C.S., Grosvenor Villa, Devonport Rd., Uxbridge
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 Woodward, Mr. J. L., Bridgewater.
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 Woolley, Mr. Hermann, 69, Market Street, Manchester.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
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 Wootton, Mr. P., George Street, Luton, Beds.
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 Wright, Mr. G. H., 103, Boro' High Street, S.E.
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 Wyley, Mr. J., Coventry.
 Wyley, Mr. W. F., Hertford Street, Coventry.
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 Wylie, Mr. T., Port Glasgow.
 Wyllie, Mr. A., 287, High Street, Glasgow.
 Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
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 Yates, Mr. F., 64, Park Street, Southwark, S.E.
 Yeomans, Mr. J., 22, Petty Cury, Cambridge.
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Young, Mr. D., 30, West Market Place, Cirencester.
Young, Mr. J., 16, Gallowtree Gate, Leicester.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, Mr. J., Folds Road, Bolton.
Young, J. R., F.C.S., Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

Members will please report any inaccuracies in these lists by letter, addressed as follows:—

THE SECRETARY,
BRIT. PHARM. CONF.,
17, Bloomsbury Square,
London, W.C.

BRITISH PHARMACEUTICAL CONFERENCE.

1880-1.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

*The names to which an asterisk is attached are those of Local Secretaries.
For Alphabetical List of Names, see page 362.*

Aberavon. Evans, E. Williams, J. P.	Accrington. Cooper, M. (Church.)	Armagh. Hillock, J.
Aberayron. Jones, J. P.	Airdrie, N.B. Harvie, J.	Ashby-de-la-Zouch. Cooper, A. Johnson, S. E. Matthews, C.
Aberdare. Evans, T. W. Jones, D. W. Richards, J. Sims, W. (Abera- man.) Thomas, W. J. Williams, T. N.	Aldershot. Fairbank, F. W. Williams, J.	Ashford, Kent. Ingall, J. Stedman, W.
Aberdeen. Davidson, C. Eddie, W. Glegg, J. Gordon, J. Gordon, W. Horton, J. A. McGregor, G. (Ellon.) Paterson, S. Rattray, W. Strachan, A.	Alfreton. Robinson, J. S.	Ashton-under- Lyne. Belfield, W. *Bostock, W. Hirst, J. Thatcher, T.
Aberford. Rishworth, H.	Alresford. Richardson, T. H.	Athy. Minclim, F. J.
Abergele. Lloyd, E., jun.	Alston. Thompson, G.	Aylesbury. Clift, H. Turner, J.
Aberystwith. Davies, D. J. Davies, J. H. Ellis, R. Vaughan, W. G. Wynne, E. P.	Altrincham. Hughes, E.	Ayr. Burns, W.
	Alva (Stirlingshire). McNicol, J.	Bacup. Dyson, A. Sutcliffe, G. H.
	Ambleside. Bell, T. Bell, T., junr.	Baldock. Bally, E. F.
	Anerley. Bullock, F.	Ballymena Beatty, J.
	Appleby. Longrigg, J.	Banbury. Simpson, T. (Bloxham.)
	Arbroath. Burn, D. H. Ogilvie, W. O. Reid, W.	

- Banchory.**
Lunan, A.
- Bangor.**
Roberts, M.
- Barking, Essex.**
Fitt, F. E.
- Barnard Castle.**
Gardner, W.
Gibson, B. W.
- Barnet.**
Huggins, G. T.
- Barnsley.**
Horne, E.
- Barnstaple.**
Goss, S.
Symons, W.
Tremear, J. J.
- Barrow-in-Furness.**
O'Neill, J.
- Barrow-on-Humber.**
Hamilton, W.
- Barton-on-Humber.**
Tomlinson, H. J.
- Barton-under-Needwood.**
Cole, J.
- Basingstoke.**
Sapp, A.
- Bath.**
Appleby, E. J.
Brooke, C.
Caswell, H. W.
Commans, R. D.
Hillier, H.
Hughes, J. E.
Humby, L. W.
Marsh, J. H.
Merrikin, J. B.
Toone, J. V.
- Bathgate.**
Freeland, J.
- Battle.**
Brailsford, H.
- Beckenham, Kent.**
Griffin, T.
- Bedale.**
Bellamy, R.
- Bedford.**
Cuthbert, J. M.
- Beeston.**
Faull, E.
- Belfast.**
Ball, T.
Clotworthy, S.
Coulter, J.
Dobbin, W.
Goskar, J. J.
Haslett, J. H.
Hodges, J. F.
Hodges, J. F. W.
McMullen, T.
Payne, J. C. C.
Pring, R. W.
- Belper, Derby.**
Burkinshaw, W. T.
- Berriew.**
Tilsley, J.
- Bervie.**
Robertson, D.
- Berwick-on-Tweed.**
Carr, W. G.
Carr, W. P.
- Betley, Staffs.**
Place, F. W.
- Beverley.**
Hobson, C.
James, K.
Marshall, T.
- Bicester.**
Sandiland, R. B.
- Biggleswade.**
Maxwell, G. N.
- Bilston.**
Gray, C.
Kearnes, R. H.
Lloyd, G. H.
- Bingley, Yorks.**
Gill, G.
Perfect, R.
Skirrow, W. E.
- Birkenhead.**
*Dutton, J.
Fawcett, J.
Foulkes, W. J.
Mullock, R.
Nicholson, H.
Stewart, J.
- Birmingham.**
Arblaster, C. J.
Atkins, W. S.
Austin, W.
Barclay, T.
Clayton, F. C.
Dewson, S.
Foster, J. A.
Griffin, J. T.
Haydon, W. F.
Holdsworth, T. W.
Jardine, W. D.
Jones, H. W.
Kimberley, W.
Leah, G. R.
Miller, W. C.
Oxborrow, E.
Paethorpe, S.
Perry, G. E.
Robinson, A. E.
Southall, A.
Southall, W.
Tait, L.
Thonger, G.
Tilden, W. A.
Tucker, H. S.
Whittles, H.
Wilkes, J. S.
Williams, J.
Wood, E. B.
- Bishop Auckland.**
Carruthers, G.
Dobinson, T.
*Leigh, J. J.
Thorburn, H.
- Bishop's Castle.**
Owen, J.
- Bishop Stortford.**
Hardy, J.
Speechly, G.
- Blackburn.**
Biekerdike, W. E.
Booth, J.
Clayton, J. W.
Critchley, T.
*Farnworth, W.
Moulden, W.
Yates, D.

- Blackpool.**
Carter, T.
Harrison, J.
Jackson, J.
- Blairgowrie.**
Crerar, J.
Grant, W.
- Blanford.**
Bird, M. M.
- Blaydon-on-Tyne.**
Miller, W.
Parker, H. J.
- Blechingley.**
Cullingford, L. J.
- Blyth.**
Kendall, J. R.
- Bodmin.**
Williams, J. D.
- Bognor.**
Long, A. T.
- Bolton, Lancashire.**
Blain, W.
Bowker, W.
Cartwright, W. A.
Challinor, S. M.
Dutton, F.
Evans, D. O.
(Farnworth.)
Forbes, T. W.
Harrison, R.
(Farnworth.)
Hart, J.
Hart, W.
Holmes, T.
(Sharples.)
Holt, A.
Mason, W. B.
Mather, W.
Morris, T.
(Farnworth.)
Pownall, T. R.
Watkinson, J. W.
(Farnworth.)
Young, J.
- Borrowstowness, N.B.**
Hughes, F. R.
- Boston.**
Clayton, D. T.
Fowler, W. R.
Pilcher, W. J.
Pille, S.
Southwell, C. H.
- Boston Spa.**
Gill, H.
- Bourne.**
*Mills, R. M.
- Bournemouth.**
Shemmounds, J.
Trim, E.
Worth, E.
- Brackley.**
Sirett, H.
- Bradford-on-Avon.**
Saunders, T. P.
- Bradford, York-shire.**
Appleyard, R.
Beanland, S.
Bell, F.
Butterworth, A.
Cockshott, W.
Drake, W. (Wyke.)
Faull, J.
Handforth, E.
Harrison, T.
Henderson, C.
(Wibsey.)
Jackson, J.
Lister, S.
Metcalfe, A. A.
Parker, S.
*Parkinson, R.
Pullan, T.
Rimington, F. M.
Sharp, J.
Silson, R. W.
Stead, T.
(Laisterdyke.)
Swaine, J.
Thornton, H.
Walker, J.
Watts, J.
West, W.
White, W.
- Braintree.**
Downing, J. G.
- Bray.**
Doran, A. E.
Vance, J. N.
Vance, W. N.
- Brenchley, Kent.**
Keene, J.
- Brentwood, Essex.**
Guest, E. P. :
- Bridge, Kent.**
Thomas, J.
- Bridge of Allan, N.B.**
Farie, G.
- Bridgend.**
Lloyd, G.
- Bridgewater.**
Woodward, J. L.
- Bridlington Quay.**
Dickins, J.
- Bridport.**
Beach, J.
Tucker, C.
- Brigg.**
Nicholson, W. O.
- Brighton.**
Barton, H.
Billing, T.
Bullen, T.
Cornish, W.
Cox, A. H.
Edwards, J. S.
Gibson, W. H.
Glaisher, T.
Guy, F.
Harris, E. R.
Histed, E.
Leigh, M.
Long, H.
Padwick, J.
Robson, T.
*Savage, W. D.
Savage, W. W.
Smith, W. H.
Sprackett, W. R. H.
Vizer, E. B.
Watts, C. C.
- Brill.**
Holmes, F. G.
- Bristol.**
Ackerman, T.
Allen, B.
Berry, W.
Boorne, C.
Boucher, J.
Bowden, T. L.
Cuff, R. C.
Freestone, T. M.
Gregory, W.
Hatch, R. M.
Jeffery, H.

- Lockyer, W. J.
 Long, J. T.
 Matthews, H.
 Pitman, J.
 Presley, E.
 Roper, J. A.
 Saunders, T. C.
 Sprackett, G.
 Stoddart, W. W. D.
 Stroud, J.
 Thomas, J. D. D.
 Townsend, C.
- Bromsgrove.**
 Haines, J. J.
 Taylor, W. G.
- Bromwich, West.**
 *Burch, W.
 Holliday, T.
 Roberts, G.
- Broseley.**
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- Brynmaur.**
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 Jones, A. M.
- Buckie.**
 Brenner, J.
- Buckingham.**
 Kingerlee, G.
- Builth.**
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- Burnley.**
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 Hitchin, R.
 *Thomas, R.
 Wilks, M.
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 Thomas, T. R.
- Burslem.**
 *Blackshaw, T.
 Cotton, J. M.
 Guest, G. C.
 Oldham, W.
- Burton-on-Trent.**
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 Brierley, J.
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 *Deck, A.
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 Mount, W.
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 philly.)
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- Caterham Valley.**
 Edwards, H.
- Cerrig-y-Druidion.**
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- Chard.**
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- Chatteris.**
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 *Barron, W.
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 *Robinson, Joseph
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Clontarf. Robinson, J. O.	Crawley. Leach, J.	Dartford. Horrell, A. E.
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Colinsburgh, N.B. Todd, T.		Derby. Barnes, B. Clifton, F. *Frost, G. Hefford, C. Monkhouse, H. Stevenson, R. Ward, J. Wilson, J.

- Devizes.**
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- Devonport.**
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*Codd, F.
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Cupiss, F.
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Gostling, W. A.
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- Droitwich.**
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Allen, W. N., jun.
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Draper, H. N.
Evaus, J.
Froedman, F.
Galwey, R. J.
Goodwin, J.
Griffin, C. H.
Grindley, G. H.
Hamilton, J. T.
- Hartford, J.**
Hartt, C.
*Hayes, W.
Holmes, J. T.
Marshall, W.
Murphy, W. C.
Nugent, —
Park, W. S.
Purefoy, R. D.
Quinlan, F. J. B.
Reynor, A.
Scott, W.
Simpson, R.
Stoney, J. D.
Thompson, S. M.
Tichborne, C. R. C.
Wells, W. F.
- Dudley.**
*Dennison, M.
Fletcher, J.
Hollier, E.
Thompson, J. W.
(Sedgley.)
Voce, W. G. (Nether-
ton.)
- Duffield.**
● Scriven, J. S.
- Dufftown.**
Proctor, A. D.
- Dumbarton.**
Babbie, J.
Binnie, R.
- Dumfries.**
Allan, W.
Fingland, J.
(Thornhill.)
- Duncanstone.**
Craig, G.
- Dundee.**
Anderson, A. B.
Davidson, J. N.
Espin, A.
Hardie, J.
Kerr, C.
Maxwell, D.
Miller, T. S.
Park, W.
Young, C.
- Dunfermline.**
Seath, A.
- Dungannon.**
Marshall, R. C.
- Dunkeld.**
M'Donald, K.
- Dunse, N. B.**
Gunn, W.
- Durham.**
*Burdon, J.
Burn, W.
Hayton, J. W.
Lambert, J.
Sarsfield, W.
Seawin, T.
- Earlestown.**
Peake, A.
Smith, J. F.
- Easingwold.**
Rookledge, J.
- Eastbourne.**
Hall, S.
- East Dereham.**
Abram, F. W.
Stangroom, F. (Cley-
next-the-Sea.)
- East Grinstead.**
Martin, H. S.
Tully, J., senr.
- East Retford.**
Appleby, C.
Fletcher, F. B.
- Eastwood.**
Ault, J.
Chambers, J.
- Eccles.**
Howie, W. L.
- Edinburgh.**
Ainslie, W.
Aitken, J.
Aitken, R.
Archer, T. C.
Baildon, H. B.
Baildon, H. C.
Blanshard, G.
Brown, D.
Buchanan, J.
Clark, W. I.
Coates, E.
Dott, D. B.
Fairgrieve, T.
Gilmour, W.
Guthrie, A. D.
Hay, M.

- Laird, G. H.
 Macadam, S.
 Macadam, W. I.
 McCowan, W.
 Macdonald, J.
 Macfarlane, A. Y.
 Mackay, G. D.
 Mackay, J.
 Mackenzie, J.
 MacLagan, D.
 Macpherson, C. A.
 Meldrum, E. D.
 Moinet, F. W.
 Napier, A.
 Noble, A.
 Pinkerton, W.
 Purves, S.
 Raimcs, R.
 Smiles, J.
 Smith, P. S.
 Smith, T.
 Stephenson, F.
 Stephenson, J. B.
 Symington, T.
 Taylor, A.
 Thompson, T.
 Todd, J.
 Wilson, J. M.
 Wylie, D. N.
 Young, J. R.
- Ely.**
 Lincolne, N.
- Emsworth.**
 Waters, H. G.
- Enfield Highway.**
 Gilbert, W.
- Ennis.**
 Seymour, T. T.
- Enniscorthy.**
 Cooke, P. M.
- Epping.**
 Rowland, T. F.
- Esher.**
 Ling, E.
- Exeter.**
 Cooper, G.
 Delves, G.
 Gadd, H.
 Hunt, A.
 Napier, G. L.
 Pasmore, G.
 Stone, F. W.
- Exmouth.**
 Teed, D.
 Thornton, S.
- Eyam.**
 Froggatt, T. W.
- Eye.**
 Bishop, R.
- Falkirk.**
 Murdoch, D.
- Falmouth**
 Guthridge, G. F.
 Newman, W. F.
- Fareham.**
 Batchelor, A. E.
 Franklin, A.
- Farnham.**
 Dunston, A.
 Higgins, W.
- Faversham.**
 Lenfestey, W. G.
- Ferry Hill.**
 Smith, R.
- Fethard.**
 Burgees, F. C.
- Fleetwood.**
 Lofthouse, J.
- Flint.**
 Jones, M.
- Folkestone.**
 Goodliffe, G.
 Stainer, J.
- Forfar.**
 Anderson, D. S.
- Formby, Lancs.**
 Blood, C.
- Forres.**
 Michie, J.
- Foulsham, Norfolk.**
 Newport, W.
- Frizington.**
 Allatt, F. T.
- Frodsham.**
 Robinson, J. F.
- Frome.**
 Harvey, W. B.
- Gainsborough.**
 Clarkson, T.
 Howlett, W. H.
- Gamrie.**
 Stephen, J.
- Gateshead.**
 Brady, H. B.
 Elliott, R.
- Glasgow.**
 Adam, T.
 Black, J.
 Brodie, R.
 Buchanan, T. D.
 Clark, S. P.
 Clarke, J. A.
 Cook, E. A.
 Davison, T.
 De Nance, W. C.
 Dickie, J.
 Fairlie, J. E.
 Fairlie, J. M.
 Fenwick, J.
 Forrest, R. W.
 Frazer, D.
 Greig, W.
 Harrower, P.
 Hume, R.
 Hunter, J. C.
 Jaap, J.
 Kennedy, W.
 Kinninmont, A.
 McAdam, R.
 Macewan, W. M.
 McLeod, T.
 McMillan, J.
 Muir, G.
 Murdoch, G.
 Nairne, J. S.
 Nicol, J.
 Paris, W.
 Paterson, A.
 Paton, J.
 Pettigrew, J. W.
 Pinkerton, J. S.
 Remmers, B. H.
 Schmidt, A.
 Stanford, E. C. C.
 Tennent, G. P.
 Twaddle, R.
 Walker, T.
 (Uddingston.)
 Wallace, W.
 Whyte, W.
 Wylie, A.

Gloucester. Berry, E. Meadows, H. Medd, J. Stafford, W. Trigg, J. W. Ward, J.	Guernsey. Arnold, A.	Hastings and St. Leonards-on-Sea. Keyworth, G. A. *Robinson, J. S. Rossiter, F. Sharman, C. R.
Goole. Roulston, B. W.	Guildford. Jeffries, H. Vennall, G. (Cranleigh.)	Haverfordwest. Jenkins, J. Saunders, D. P.
Govanhill. Steele, J. C.	Guisborough. Baucks, A.	Hay. Davies, J. L.
Gorleston, Yarmouth. Thurlby, G.	Guiseley. Archer, J. S.	Hayle. Williams, W. H.
Gosforth. Gaitskill, J.	Hadfield. Jones, J.	Heanor. Simpson, D. O.
Gosport. Mumby, C.	Halifax. Dyer, W. Farr, J. Pedley, T.	Hebden Bridge. Hey, D.
Gourock. Barr, R. Peters, J.	Haltwhistle. Bell, J. Milligan, D. G.	Heckmondwike. Booth, J. Stephenson, J. N.
Govan. Dunlop, T.	Hamilton. Mackill, R. C. Stewart, J.	Helenburgh. Harvie, G.
Grantham. Cooper, E. G. Fisher, F. D. Hall, R. A. *Hopkinson, T. Lunn, T. Newcome, J. Whysall, W.	Hanley, Staffs. Jones, G. H. Lloyd, J. Smith, A. H. Tirrell, J. Wilson, W.	Helmsdale. Paterson, J.
Grassington. Chapman, W.	Harleston. Borrett, H. Muskett, J.	Helmsley. Allenby, W.
Great Bedwin. Gerard, G. R.	Harpenden. Busby, J.	Helston. Troake, M. H. Wakeham, C.
Great Warley, Essex. Hayes, J.	Harrogate. *Counland, J. Davis, R. H. Taylor, J. H. Wilson, J. H.	Hemel Hempstead. Argue, G.
Greenock. Armitage, G. Baine, J. A. Duncan, S. Fisher, T. McNaught, A. Wilson, G.	Harrogate. *Counland, J. Davis, R. H. Taylor, J. H. Wilson, J. H.	Hereford. Walker, J.
Grimsby. Bottrill, G. T. Cook, R. Gossop, G. K. Watson, H., jun.	Hartlepool. Emerson, C. (West.) Harpley, R. B. McBeath, J. W. (West.) Warwick, D. H.	Hertford. Durrant, G. R.
	Harwich. Bevan, C. F. Harding, J.	Hexham. Riddle, W. R. Turner, J.
	Haslingden. Falshaw, J.	Heywood. Mills, W. H.
		Hinckley. Gilbert, G. Pridmore, W.
		Hirwain. George, J. E. Sims, J.

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| Hitchin.
Ransom, W. | Hungerford.
Telfer, H. V. | Kelso.
Conacher, D.
Dodds, G. F. |
| Holsworthy.
Oliver, J. G. | Huntly.
Beatt, D.
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Sneed, J. |
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(Sedbergh.)
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| Houghton-le-Spring.
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Devon.
Trouke, W. H. |
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Baynes, J.
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Oldham, J.
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Sayer, E. C. | King's Lynn, see
Lynn. |
| | Ironville.
Greaves, W. S. | Kingston-on-Thames.
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Ereaut, G. | |
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Skinner, M. H. | |

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 Brooke, T.
 Broughton, A.
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 Brownhill, R. S.
 Clapham, J.
 Clapham, J. W.
 Day, J.
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 *Reynolds, R.
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- Leek, Staffs.**
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 *Richardson, J. G. F.
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- Toone, J. H.**
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- Liverpool.**
 *Abraham, J.
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 (Woolton.)
 Buck, J. M.
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 Chelley, W. D.
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 Evans, E.

- Evans, E., junr.
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| Tupholme, J. T. | Ince, J. | Watts, W. |
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| Witherington, S. H. | Jones, W. C. | Williams, J. J. |
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| | Keene, E. | Woodland, J. |
| | Kingsford, F. | Wooster, J. R. |
| | Kingzett, C. T. | Wright, C. R. A. |
| | Knight, G. J. | Wyles, W. |
| | Lewinton, A. B. | |
| | Linford, J. S. | |
| | Long, H. | |
| | McMillan, J. L. | |
| | Marsh, E. R. | |
| | Martindale, W. | |
| | Mason, R. W. | |
| | Mathews, J. H. | |
| | Mathews, W. | |
| | Mellin, G. | |
| | Moyle, J. | |
| | Nutt, A. J. | |
| | Parker, R. H. | |
| | Pickard, W. | |
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| London, W. | London, W. C. |
| Adlington, W. B. | Attfield, J. |
| Andrews, F. | Barber, J. S. |
| Backhouse, H. N. | Bentley, R. |
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| Bascombe, F. | Challice, W. G. W. |
| Bathe, R. S. | Cooper, H. |
| Bettle, J. A. | Davenport, H. |
| Bird, A. | Davenport, J. T. |
| Bird, W. L. | Gerrard, A. W. |
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| Brightmore, W. | |
| Brownen, G. | |
| Bullock, J. L. | |
| Burden, E. M. | |

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Huggins, R.
Huskisson, H. O.
Morson, T. P.
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- Londonderry.
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Taaffe, H.
- Longford.
MacManus, J. H.
- Long Stratton.
Cooper, F. T.
- Long Sutton.
Sutterby, J. N.
- Longton.
Prince, A. G.
Turner, T.
- Louth.
Greenwood, J. T.
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Simpson, H. D.
- Lowestoft.
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Hume, J. W. D.
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Hall, E.
Wootton, P.
- Lymm, Cheshire.
Evans, I. H.
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- Lynn, Norfolk.
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Cocher, J. A.
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- Lytham.
Crozier, R.
- Macclesfield.
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- Macduff.
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- Maesteg.
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- Maidenhead.
Martin, R.
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- Maidstone.
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- Malton.
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- Malvern.
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Metcalfe, E. H.
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- Malvern Wells.
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Bury, J.
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(Bowdon.)
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- Gee, S. (Castleton.)
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- Pembroke Dock.**
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The North British Branch of the Pharmaceutical Society of Great Britain.
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- ABERDEEN.**—Society of Chemists and Druggists (1839). Mr. A. Strachan, 111, George Street, Aberdeen.
- ARBROATH.**—Chemists' Association. Mr. D. Gordon, 1, Addison Pl., Arbroath.
- ASHTON-UNDER-LYNE.**—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). Mr. E. Fisher, 106, Stamford Street, Ashton-under-Lyne.
- BIRMINGHAM.**—Midland Counties Chemists' Association (1869). Mr. S. Dewson, 90, New Street, Birmingham. Chemists' Assistants' Association (1868), Birmingham.
- BRADFORD.**—Chemists' Association (1869). Mr. H. G. Rogerson, Bradford.
- BRIGHTON.**—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.
- BRISTOL.**—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.
- COLCHESTER.**—Association of Chemists and Druggists (1845). Mr. J. L. Chaplin, 124, High Street, Colchester.
- COVENTRY.**—Coventry and Warwickshire Pharmaceutical Association (1877). F. J. Barrett, F.C.S., 75, Hertford Street, Coventry.
- DUNDEE.**—Chemists and Druggists' Association (1868). J. Russell, Dundee.
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- OLDHAM.**—Chemists' Assistants and Apprentices' Association (1870). Mr. J. Naylor, Oldham.
- PLYMOUTH.**—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.
- SCARBOROUGH.**—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.
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- TAUNTON.**—Chemists' Association (1870). Mr. H. Prince, Fore Street, Taunton.
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OF THE

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AT THE

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J. W. LLOYD, Swansea.

Local Committee.

<p>ALEWOOD, Mr. E., Swansea. BEND, Mr. T., Swansea. BONNETT, Mr. F., Swansea. DAVIS, Mr. J., Swansea. DAVIES, Mr. J., Swansea. DAVIES, Mr. J. M., Swansea. DAVIES, Mr. J. T., Swansea. DEANE, Mr. ROBT., Cardiff. EVANS, Mr. G., F.C.S., Llanelli. EVANS, Mr. EVAN, Aberavon. GEORGE, Mr. J. R., Hiram. GEORGE, Mr. W., Swansea.</p>	<p>GRIFFITHS, Mr. W., Swansea. GROSE, Mr. N. M., Swansea. HAYMAN, Mr., North. HOLMAN, Mr., Cardiff. HUGHES, Mr. JAMES, Swansea. HUGHES, Mr. T., Llandilo. JONES, Mr. MOSES, Swansea. JONES, Mr. JAMES, Cardarthen. KEY, Mr. W. H., Pontypridd. LLOYD, Mr. J. W., Swansea. LLOYD, Mr. J., Bridgend. PARLEY, Mr. H. H., Swansea.</p>	<p>POWELL, Mr. D., Swansea. PROCTER, Mr. S. J., Cardiff. REES, Mr. DANIEL, Swansea. RICHARDS, Mr. J., Swansea. ROBERTS, Mr. J. K., Swansea. SMYTH, Mr. R., Mether Tyddil. SUNS, Mr., Hiram. THOMAS, Mr. H. J., Swansea. THOMAS, Mr., Aberdare. TRICK, Mr. MITCHELL, Swansea. WHITE, Mr. J. D., Cardarthen. WILLIAMS, Mr. J. T., Swansea.</p>
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THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
ROYAL INSTITUTION OF SOUTH WALES, SWANSEA,
ON TUESDAY AND WEDNESDAY, 24th AND 25th AUGUST, 1880,
Commencing at Half-past Ten a.m. each day.

MONDAY, 23rd AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Secretaries, at 8 p.m., at the Cameron Arms Hotel, High Street.

TUESDAY, 24th AUGUST.

The CONFERENCE met at 10.30 o'clock a.m., adjourning at 1 p.m.; and at 2.30 o'clock p.m., adjourning at 5 p.m.

Order of Business.

Reception of Delegates.
 Report of Executive Committee.
 Financial Statement.
 Report of Treasurer of the "Bell and Hills" Library Fund.
 President's Address.
 Reading of Papers and Discussions thereon.

PAPERS.

1. *Report on the Aconite Alkaloids.* C. R. A. WRIGHT, D.Sc., F.I.C., F.C.S., and E. H. RENNIE, M.A., D.Sc., F.C.S.
2. *Notes on the Essential Oil of Buchu Leaves.* Professor FLÜCKIGER, Ph.D.
3. *Notes on the Constitution of Peppermint Oil.* Professor FLÜCKIGER, Ph.D., and J. B. POWER, Ph.D.
4. *Note on the Restoration of Discoloured Syrup of Iodide of Iron.* T. B. GROVES, F.C.S.
5. *The Detection of Amorphous Quinine in Ferri et Quiniae Citras.* J. DE VRIJ, Ph.D., C.I.E.
6. *New and Unofficial Pharmaceutical Preparations.* C. SYMES, Ph.D.
7. *The Cultivation of Cinchona Calisaya.* J. E. HOWARD, F.R.S.
8. *A Peculiar Kind of Cinchona Bark.* B. H. PAUL, Ph.D., F.C.S.
9. *Ipecacuanha Wine.* J. B. BARNES, F.C.S.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of Luncheon served in the Garden of the Royal Institution.

The Executive Committee met immediately after the close of the general meeting on this day.

6.30. The Local Committee accompanied many of the Members on an inspection of the Hafod Copper Works and Lodore Tin Plate Works.

WEDNESDAY, 25th AUGUST.

The CONFERENCE met at 10.30 o'clock a.m., adjourning from p.m. till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

10. *Notes on a Journey Eastward.* H. B. BRADY, F.R.S.
11. *Note on Indian Henbane.* T. GREENISH, F.C.S., F.R.M.S.
12. *Further Notes on Petroleum Spirit.* A. H. ALLEN, F.I.C., F.C.S.
13. *A Sample of Cayenne Pepper.* T. GREENISH, F.C.S., F.R.M.S.
14. *The Green Extracts of the Pharmacopœia.* W. A. H. NAYLOR, F.C.S.
15. *Note on the Presence of Arsenic in Tincture and Solution of Perchloride of Iron.* F. W. FLETCHER, F.C.S.
16. *The Gravimetric Estimation of Minute Quantities of Arsenicum.* F. W. FLETCHER, F.C.S.
17. *Emulsions.* A. W. GERRARD, F.C.S.
18. *Determination of the Strength of Alcoholic Solutions of Chloroform.* J. C. THRESH, F.C.S.
19. *Report on Commercial Specimens of Sal Volatile and Chloric Ether.* J. C. THRESH, F.C.S.
20. *Report on the Strength of Commercial Specimens of Aqua Lauro Cerasi.* J. WOODLAND, F.L.S., F.C.S.
21. *The Strength and Purity of the Alkaline Solutions of Potash and Ammonia met with in Pharmacy.* J. WOODLAND, F.L.S., F.C.S.

Place of Meeting for 1881.

Election of Officers for 1880-81.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all members attending the meeting, on invitation of the Local Committee, partook of Luncheon served in the Garden of the Royal Institution.

In the evening many of the Members, accompanied by the Local Committee, went for a marine excursion round the Bay.

THURSDAY, 26th AUGUST.

Most of the Members attending the Swansea Meeting, accompanied by the Local Committee, went for a very pleasant excursion to Oxwich Bay.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN SWANSEA, 1880.

THE Seventeenth Annual Meeting of the British Pharmaceutical Conference commenced on Tuesday, August 24th, at the Royal Institution of South Wales, Swansea, under the presidency of W. Southall, Esq., F.L.S., of Birmingham.

The following members and visitors were present during the meetings:—

Aberdare.—T. W. Evans, J. Richards, W. J. Thomas.

Barnsley.—T. Lister.

Brighton.—W. D. Savage, W. W. Savage.

Bridgend.—J. Lloyd.

Birmingham.—W. Southall.

Burry Port.—T. R. Thomas.

Carmarthen.—J. D. White.

Cheltenham.—W. Barron.

Chicago (U.S.)—C. G. Wheeler.

Clifton.—G. F. Schacht.

Droitwich.—E. Taylor.

Edinburgh.—Dr. S. Macadam.

Exeter.—G. Pasmore.

Gateshead.—H. B. Brady.

Gloucester.—H. Meadows, W. Stafford.

Leeds.—R. Reynolds.

Lampeter.—J. W. Evans.

Landore.—H. J. Thomas.

Leamington.—W. H. Pullin.

Leicester.—J. W. Clark.

Leighton Buzzard.—R. Richmond, jun.

Liverpool.—A. H. Mason, Dr. C. Symes.

Llanelly.—G. Evans, E. Hughes.

Llandilo.—T. Hughes.

London.—F. Andrews, Prof. J. Attfield, J. B. Barnes, S. M. Bur-

roughs, R. H. Davies, F. W. Fletcher, A. W. Gerrard, T. Greenish, M. Howell, A. B. Lewinton, W. A. H. Naylor, F. Pasmore, Dr. B. H. Paul, S. Plowman, J. T. Savory, Dr. A. Senier, C. Umney, A. C. White, J. White, A. C. Wootton.

Merthyr.—W. Smith.

New York (U.S.).—H. S. Wellcome.

Pontardawe.—W. Samuel.

Philadelphia (U.S.).—Prof. J. M. Maisch, Mrs. Maisch, Dr. F. Power.

Pontypridd.—W. H. Key.

Roehampton.—J. Swain.

Sheffield.—A. H. Allen, G. Ellinor, H. W. Malcham, W. Ward.

Shepton Mallet.—G. Cottrill.

Southampton.—R. Chipperfield.

South Molton.—R. H. Swingburn.

Swansea.—F. Bonnett, J. T. Davies, J. Hughes, W. George, N. M. Grose, M. Jones, J. W. Lloyd, W. Morgan, D. Powell, D. Rees, M. Trick, J. T. Williams.

York.—J. Clark.

MEETINGS OF THE EXECUTIVE COMMITTEE.

The Executive Committee met on Monday evening, August 24th, and on the Tuesday afternoon following. There were present on Monday—Mr. W. Southall, *President*; Messrs. Brady, Schacht, Reynolds, Ward, and Grose, *Vice-Presidents*; Professor Attfield, *Hon. Gen. Sec.*; Dr. Senier, *Assist. Sec.*; and Messrs. Ellinor, Hughes, Malcham, Mason, Symes, Umney, and J. T. Williams.

The minutes of the previous meeting were read and approved.

The subject of a General Index to the Conference Proceedings and Year-Books was considered, and on a motion of Mr. Brady, seconded by Dr. Symes, it was resolved:—

“That it is desirable to print a General Index upon the lines indicated in the approximate estimate submitted by the Senior Honorary Secretary, and that the details be left to the Year-Book Committee.”

Professor Attfield reported that a complete set of *Year-Books* had been presented to the Pharmaceutical Society of Ireland.

Mr. Brady said that the Sub-committee appointed to consider staff changes in view of Professor Attfield's approaching resignation had endeavoured to make an arrangement by which the Conference should suffer as little as possible. The resignations of the Junior Honorary Secretary and of the Treasurer had also

been placed in their hands, so that they might be more free to act. He was glad to say that they had succeeded in obtaining permission to propose Mr. Carteighe for the Honorary Secretaryship, in place of Professor Attfield, and that Messrs. Bengier and Ekin were willing to retain their positions.

The President having expressed his satisfaction at the report of the Sub-committee, it was adopted.

Drafts of the financial statement and of the programme of proceedings at the Annual Meeting were then presented by Professor Attfield, and adopted.

Professor Attfield read a letter which he had received from Mr. Davison, of York, inviting the Conference to visit York in 1881. It was decided that the invitation be recommended for acceptance to the members.

A grant of £5 was moved to be given to Mr. Thresh for continued researches upon ginger.

A number of gentlemen were elected members, and the names of a few whose subscriptions were more than two years in arrears were removed from the roll.

The Report of the Executive Committee was then considered and adopted.

At the meeting on Tuesday, there were present—Mr. Southall, *President*; Messrs. Brady, Schacht, Ward, and Grose, *Vice Presidents*; Professor Attfield, *Hon. Gen. Sec.*; Dr. Senier, *Assist. Sec.*; and Messrs. Hughes, Greenish, Mason, Symes, and Umney.

The minutes of the previous meeting were read and approved, and several gentlemen were elected members of the Conference. Some recommendations were made respecting the composition of the Committee of Publication of the Year-Book, and a list of officers for 1880-81, to be recommended to the meeting, was decided upon.

On the motion of Mr. Greenish, seconded by Professor Attfield, it was resolved:—

“That it is desirable that there should be a list of all new books and pamphlets having Pharmaceutical interest published in the *Year-Book* for 1881 and following years, and that the details respecting such publication be referred to the Publication Committee.”

The Committee then adjourned.

GENERAL MEETING.

Tuesday, August 24th.

At the commencement of the proceedings Mr. N. M. GROSE, the Local Vice-President, in the name of the chemists and druggists of Swansea and South Wales, welcomed the members of the Conference to Swansea. He said he hoped the meeting would prove both pleasant and profitable. He had much pleasure in announcing that, in addition to the local arrangements stated on the programme, the members of the Conference were offered tickets for local museums, and if any gentlemen who were able to remain until Friday would like to visit a coal mine, an opportunity would be provided for that purpose.

RECEPTION OF DELEGATES.

Professor ATTFIELD, Honorary General Secretary, then read the following list of delegates:—

From the *Pharmaceutical Society of Great Britain*.—The President (T. Greenish, F.C.S.), Vice-President (G. F. Schacht, F.C.S.), and Messrs. Andrews, Symes, and Savage.

From the *Pharmaceutical Society of Ireland*.—The President (C. R. C. Tichborne, Ph.D., LL.D.), and Messrs. H. Bennett, and J. E. Brunker, M.A.

From the *Brighton Association of Pharmacy*.—Messrs. W. D. Savage, T. Billing, and Marshall Leigh.

From the *Bristol Pharmaceutical Association*.—G. F. Schacht, F.C.S.

From the *Exeter Pharmaceutical Society*.—Mr. G. Pasmore.

From the *Glasgow Chemists and Druggists' Association*.—Messrs. T. Davison and Rait.

From the *Leeds Chemists' Association*.—R. Reynolds, F.C.S.

From the *Leicester Chemists' Assistants and Apprentices' Association*.—Mr. T. W. Clark.

From the *Liverpool Chemists' Association*.—Dr. Symes, and Messrs. A. H. Mason, F.C.S., and R. Sumner.

From the *Manchester Chemists and Druggists' Association*.—Messrs. F. B. Bengel, F.C.S., and L. Siebold, F.I.C., F.C.S.

From the *Sheffield Pharmaceutical and Chemical Society*.—Messrs. Ward, Ellinor, and Maleham.

From the *York Chemists' Association*.—Mr. Clark.

The PRESIDENT said that, in addition to the above list, the Conference was also favoured with the presence of a distinguished visitor from the other side of the Atlantic, Professor Maisch, of Philadelphia, whose name was well known to all present, not only as an independent investigator, but also as author, in conjunction with Professor Stillé, of a book which had attained a very high reputation.

Professor MAISCH said he was very pleased to be able to meet the Conference, and only regretted that having already made arrangements to leave England immediately, he should not be able to remain throughout the meeting.

Dr. SENIER, Assistant-Secretary, read the following report of the Committee :—

REPORT OF THE EXECUTIVE COMMITTEE.

Your Committee have met on several occasions since the last general meeting of the Conference, and amongst other matters of importance have carefully considered and discussed the advantages and disadvantages of continuing to hold the annual meetings in the same town and practically at the same time as the meetings of the British Association. The following is a summary of the opinions expressed on both sides.

It was pointed out that considerable difficulty is often experienced by local officers who are on the organizing committees of both bodies; that much inconvenience is often felt by members of the two bodies on the Conference excursion day; and that it is frequently impossible to obtain adequate hotel accommodation, especially by members of the Conference who do not wish to remain in a town for the Association meetings after the Conference meetings are over. On the other hand, it was thought that the time and town of meeting of the British Association had come to be so generally understood as the town and time of meeting of the Conference, that the whole organization of the latter would be much upset by a change. The simultaneous character of the gatherings was one of great convenience to many men, though it might be the opposite to others. It was not perhaps always easy to work up local pharmaceutical enthusiasm, but that was less difficult of accomplishment when a whole town had been fired with the idea of entertaining a large body like the British Association, than in the absence of such an impetus. Inquiries had been made on the subject, and correspondence had been carried on with former local secretaries and others, with a view to obtaining a general opinion on the point; many influential members

preferred the existing practice with all its disadvantages; the meetings would probably suffer in point of number of members attending—both as regards local and visiting members—if the meetings were held at times other than those just preceding and overlapping the times fixed for the meetings of the British Association, as many members would not care to go to a town twice within a month or so. Local members, too, preferred to have the Conference at the least busy times of the year, which were just the times selected for the visit of the British Association. The Conference meetings might be held at the same time in some more or less distant town, but members wishing to economize time would object to such an arrangement. The teaching class contributed many men and papers to the Conference, and these would probably only attend during August or September. At whatever time during either of those months the meetings were held, it would fit in with the holiday arrangements of some men, and clash with those of others.

The following resolution was finally carried:—"The Committee having again had under consideration the desirability of holding the annual meetings of the Conference at times other than those just preceding and overlapping the times of the meetings of the British Association, or of holding them in towns other than those visited by the British Association, and having received opinions on the subject from local secretaries and other members of the Conference, conclude that any immediate alteration of the existing practice as regards times and places of meeting is undesirable."

Your Committee have had under consideration the advisability of publishing a general index of the ten *Year-Books* issued since 1870, and six numbers of "Proceedings" issued before 1870, and they have instructed the *Year-Book* Committee to superintend the production and gratuitous distribution of such an index to members.

Since the last annual meeting eighty-two candidates have been elected to membership of the Conference. Their names are appended to this report.

Your Committee regret to have to report that only a single application has been made for a money grant in aid of research. It may not be amiss to remind members, especially those who have received some scientific training, that the Conference has funds at its disposal, and that there is no way in which they can be applied in more complete accordance with its avowed object than in the assistance of those who are able to undertake investigations in connection with the history of medicinal substances. The field is a

wide one, as may be gathered from the list of subjects annually circulated by the Executive Committee, and it is earnestly hoped that our younger members may be induced to adopt original research as part of their duty to the profession to which they have devoted themselves.

It is the painful duty of your Committee to report, officially, the death of Mr. William Walter Stoddart. The constant devotion of Mr. Stoddart's life to the cause of science generally, and his great help to the highest interests of this Conference, not only during the year in which he occupied the post of its Presidency, but in the numerous papers he communicated to its "Proceedings" from its first meeting in Bath to the last he was able to attend in Sheffield, render this special allusion to his loss by your Committee a simple though a sad duty.

They have also, with great regret, to announce that the Conference is about to lose the important services of Professor Attfield, as Senior General Secretary.

The distinguished position which the British Pharmaceutical Conference has achieved and has now for some time enjoyed as an organization for the development of scientific pharmacy, has been so largely due to the ability and energy of Professor Attfield, that his retirement from the sphere of work in which he has so usefully laboured creates a void which your Committee feel it must be difficult to supply. They earnestly invite the co-operation of the members generally in the efforts they will be compelled to make to render this loss as little disastrous as possible.

List of Members elected during the year by the Executive Committee.

Adams, Mr. B., Nottingham.
 Anthony, Mr. D., Cardiff.
 Arton, Mr. R., Manchester.
 Austin, Mr. W., Birmingham.
 Bagshaw, Mr. W. B., Staly-
 bridge.
 Blunt, Mr. J. H., Northampton.
 Bowman, Mr. E. J., Douglas,
 Isle of Man.
 Bradley, Mr. C., Reading.
 Bryne, Mr. J., Cheddar.
 Buckle, Mr. J., Malton.
 Cameron, Mr. J., London.

Chislett, Mr. C., Lanark.
 Cooper, Miss Helen, London.
 Cotterill, Mr. S., Congleton.
 Critchley, Mr. T., Blackburn.
 Cullingford, Mr. L. J., London.
 Davison, Mr. R., York.
 Elliott, Mr. J. G., Sheffield.
 Ellis, Mr. G. Southport.
 Ellis, Mr. W., Burnham.
 Evans, Mr. W. P., Liverpool.
 Fairbank, Mr. F. W., Alder-
 shot.
 Fewtrell, Mr. J., Turriff.

Fowke, Mr. T. E., Stafford.
Gale, Mr. H., London.
Garlike, Mr. T., Ripley.
Hall, Mr. P., Newcastle-on-Tyne.
Harrison, Mr. T. E., Sleaford.
Hayman, Mr. A., Neath.
Hayton, Mr. J. W., Durham.
Hodgetts, Mr. G., Toronto,
Canada.
Holgate, Mr. S. V., York.
Holmes, Mr. C. J., London.
Hooper, Mr. L., London.
Horton, Mr. J. A., Aberdeen.
Huggins, Mr. G. T., Barnet.
Hughes, Mr. T., Llandilo.
James, Mr. C. A., Clifton.
James, Mr. J., Weston-super-
Mare.
James, Mr. K., Beverley.
Jones, Mr. G. H., Hanley.
Kimber, Mr. B. T., London.
Knight, Mr. G. G., London.
Leah, Mr. G. R., Birmingham.
Leake, Mr. F., York.
Lloyd, Mr. J., Bridgend.
Martin, Mr. H. S., Glasgow.
Marsh, Mr. G., Plymouth.
Marshall, Mr. T., Beverley.
Melrose, Mr. W., York.
Minchim, Mr. F. J., Athy.
Morris, Mr. W. W., Talgarth.
Parker, Mr. C., Milnthorpe.
Parker, Mr. R. H., London.

Polley, Mr. J., Blackheath.
Porter, W. E., F.C.S., Wor-
cester.
Procter, Mr. S. J., Cardiff.
Richardson, Mr. F. H., Alres-
ford.
Reid, Mr. W., Arbroath.
Rishworth, Mr. H., Leeds.
Salter, Mr. B., Uckfield.
Saunders, Mr. J. W., London.
Sharman, Mr. C. R., St. Leon-
ards-on-Sea.
Smith, Mr. E., London.
Sowray, Mr. J., York.
Stewart, Mr. D., Kirkwell.
Taylor, Mr. J. M., London.
Thomas, Mr. H. J., London.
Thomas, Mr. J. E., Swansea.
Thomas, Mr. T. R., Northampton.
Todd, Mr. J., Edinburgh.
Trigg, Mr. J. W., Gloucester.
Turnbull, Mr. A., Sunderland.
Walsh, Mr. J. E., Tunbridge
Wells.
Wellcome, Mr. H. S., London.
Whiting, Mr. J., Coventry.
Williams, Mr. J. P., Aberavon.
Williams, M. E., M.D., London.
Willis, Mr. C., King's Lynn.
Wilson, Mr. T. W., York.
Witherington, Mr. S. H., London.
Wood, Mr. A., Sheffield.

Professor ATTFIELD then read the Financial Statement, as follows :—

FINANCIAL STATEMENT, 1879-80.

*The General Fund.**The Senior. Hon. Secretary in Account with the British Pharmaceutical Conference.*

	Dr.	£	s.	d.
To Sale of Year-Books by Secretary		7	17	6
„ „ „ Publishers		29	0	0
„ Advertisements in 1877 vol.		2	14	6
„ „ 1878 vol.		12	0	6
„ „ 1879 vol.		103	12	0
„ Subscriptions from Members		799	11	6
		<hr/>		
		£954	16	0

	Cr.	£	s.	d.
By Expenses connected with Year-Book :—				
Butler & Tanner for printing, binding, and banding	£108	7	5	
Editor's Salary	150	0	0	
Messrs. Churchill :—				
Commission on Advertisements	29	11	9	
Advertising Year-Book	2	18	0	
Delivery to Members	67	17	1	
Foreign Journals (Nutt)	3	7	9	
		<hr/>		
		662	2	0
„ General Printing :—				
McCorquodale & Co.	3	10	0	
Stevens & Richardson	15	12	6	
Parkins & Gotto	2	3	1	
		<hr/>		
		21	5	7
„ Directing Circulars and Envelopes		5	7	3
„ Assistant-Secretary's Salary		40	0	0
„ Postage (about 11,500 letters).		47	16	0
„ Sundries		11	17	11
„ Expenses of Meeting at Sheffield		15	11	3
„ Balance to Treasurer		150	16	0
		<hr/>		
		£954	16	0

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1879.	Dr.	£	s.	d.
To Balance in hand on July 1st		112	4	5
July. To Dividend on £250 Consols		3	13	6
1880.				
Jan. To Dividend on £250 Consols		3	13	6
June 30. To Cash from Hon. Sec.		150	16	0
		£270	7	5
1880.	Cr.	£	s.	d.
June 30. By Balance		270	7	5
		£270	7	5

	£	s.	d.
Assets July 1, 1880 { Cash in hand	270	7	5
{ Consols (stock)	250	0	0

The Bell and Hills Library Fund.

The Hon. Treasurer in Account with the British Pharmaceutical Conference for Year ending June 30th, 1880.

1879.	Dr.	£	s.	d.
To Balance in hand on July 1		4	19	7
July. To Dividend on £350 Consols		5	2	9
1880.				
Jan. To Dividend on £350 Consols		5	2	9
		£15	5	1
1880.	Cr.	£	s.	d.
By Balance		15	5	1
		£15	5	1

	£	s.	d.
Assets July 1, 1880 { Cash in hand	15	5	1
{ Consols (stock)	350	0	0

Examined and found correct, { G. ELLINOR, Sheffield. } Auditors.
{ J. LLOYD, Swansea. }

Mr. SCHACHT explained that the financial statement would have been presented by the Treasurer, Mr. Ekin, but that gentleman was unable to be present, and had written desiring him to apologise to the Conference for his unavoidable absence.

The PRESIDENT then moved the adoption of the report and financial statement.

Mr. SAVAGE (Brighton) seconded the motion, and it was at once carried unanimously.

THE LATE MR. STODDART.

Mr. REYNOLDS (Leeds) said there was one paragraph in the report which must have awakened deep feelings in the minds of all present, the one which referred to the great loss the Conference had sustained. Those who were not aware of Mr. Stoddart's illness must have felt a great shock, as he did, when they heard the news. He had ventured to put into the form of a resolution what he believed would represent the feelings of the members of the Conference on the subject, and would move—

“That the Conference records its deep regret at the removal by death of Mr. W. W. Stoddart, of Bristol, who was one of its earliest supporters. Mr. Stoddart's sound and extensive knowledge of pharmacy, and his devotion to pharmaceutical research had long been highly valued by his professional brethren, and were formally recognised by his election to the post of President of the Conference during the years 1870 and 1871. Mr. Stoddart performed the duties of the office with great ability, and his genial and kindly disposition and readiness to give countenance and advice to younger inquirers secured for him the warm personal esteem of his fellow members.”

He would also move—

“That the foregoing resolution be entered upon the minutes, and that a copy be forwarded to Mrs. Stoddart, with the assurance of the deep sympathy of the meeting with herself and family under their great bereavement.”

Mr. BRADY (Newcastle-upon-Tyne) seconded the motion.

The PRESIDENT said all present would feel the propriety of the resolution, and he would simply put it without attempting to echo what had been so well said.

The motion was carried unanimously.

The PRESIDENT then delivered his opening address as follows:—

THE PRESIDENT'S ADDRESS.

When asked to accept the office of President of the Conference for the present year, I naturally hesitated, remembering the distinguished names and services to pharmacy of those who have hitherto occupied the chair. I felt that it was a position that required qualifications I could hardly aspire to. I decided, however, that I ought not to refuse such an honourable office, and therefore appear before you this day to deliver the customary address.

In speaking of my predecessors, my first thought is of the loss the Conference has met with since our last meeting in the removal by death of our excellent friend, Mr. Stoddart, who filled the chair in the years 1870 and 1871. We shall sadly miss the genial presence and bright intellectual powers of one who for so many years took an active part in our deliberations, and to whom no small portion of the success of our meetings is due.

My next thought has reference to the place of our meeting, and I have the pleasure for the first time of giving the right hand of fellowship to our brethren of the Principality on their own soil. There is no political boundary between England and Wales, simply one of race, therefore any emulation between us can only be the highly honourable one of progress, and that the Cymry are well represented in the practice of pharmacy, both in their own land and in English pharmacies, is an indisputable fact.

In making the very difficult choice of a subject upon which to address you, I had to choose between the abundant past and the limitless present, between the technical portion of our profession and the results of science which bear upon or are connected with it. The subjective view of pharmacy has recently been most ably laid before us. Pharmaceutical education is very much to the front just now, but I leave its elucidation in the very competent hands that are identified with it. Practical pharmacy and the *materia medica* of the present are dealt with in the *Year-Book*. I therefore came to the conclusion that the past of pharmacy would still afford abundant material to work upon, and that I might present to you a few phases of its history that would still possess something of novelty and interest.

The first phase in the history of pharmacy that I wish to bring before you, is that which existed in Italy about the time of the Christian era, and a description of it is to be found in the works of Roman authors.

This was a period of high intellectual cultivation, and amongst

the literature of the Augustan age that has descended to us are the works, not only of poets, orators, and historians, but also of physicians and naturalists.

Anterior to this time Greece had led the van in medicine as in science and philosophy, and the names amongst physicians of the somewhat mythical *Æsculapius* and his descendants the *Asclepiads*, amongst whom was *Hippocrates of Cos*, will occur to us as having with others laid the foundations of medical science. Medicine then formed a part of philosophy. *Pythagoras*, for example, wrote upon it, and to attempt a history of its rise and progress would, of course, be out of place here. Anatomy and physiology had made considerable progress. *Aristotle* had written his *History of Animals*, materials for which were provided at an enormous cost by the orders of *Alexander the Great*, and the great School of *Alexandria* was founded, where anatomy was studied, illustrated by dissection of the human body. At *Alexandria* laboured *Theophrastus*, pupil of *Aristotle*, who founded the science of botany and also wrote on *materia medica*. *Aristotle* himself also wrote on plants and on pharmacy. With the decay of the School of *Alexandria* learning began to shift westward. *Asclepiades of Bithynia*, a noted physician, whose works have perished, appears to have migrated to Rome about 90 B.C. About one hundred years after him flourished three men who have left their mark upon medical science: *Celsus*, a physician of Rome; *Pliny*, whose great work on *Natural History* was a collection of things credible and incredible, but was stored with information respecting *materia medica* and on medical subjects in general; and *Dioscorides*, whose renowned work on *Materia Medica* and Botany held its position in the first rank of authority for sixteen hundred years. *Dioscorides* is said to have been physician to *Antony* and *Cleopatra*, but it does not appear to be quite certain when he lived. *Pliny* quoted from him largely, but he does not give his name, as he does those of a multitude of authors whose works he quotes. *Galen*, whose name will be afterwards referred to, and who was a brilliant Greek physician, died some two hundred years later.

The name of *Celsus* is one we all know by sight very well, but it is specially familiar to the medical profession. Speaking as a pharmacist, pharmacists in general are, I believe, not much acquainted with his writings. *Celsus* wrote "Eight Books on Medicine," and his works are translated into English, and there are at least two translations of the first four books, one of them by *Dr. Steggall*, a name familiar to the earlier students at *Bloomsbury*

Square. From this I judge that our medical friends devote their energies mainly to these four books, possibly to the neglect of the others, and as the book relating to pharmacy is the fifth, I feel less compunction in taking it as the text of the first part of my observations.

In the time of Celsus, who was a friend of Horace and of Ovid, and who is alluded to by both writers, luxury prevailed at Rome to a great extent. Horace makes some one say :—

“ By Jove, I wonder not that folks should eat
At one delicious meal a whole estate.” *

Civilization or what not produced luxury, luxury disease, disease required physicians, and physicians needed drugs. Some of the moralists of the present day tell us that our civilization approaches very near to the gilded heathenism of the Romans, by which a progression backwards is evidently indicated; but however this may be, it is quite certain that many things were done at Rome that have also become the custom of these highly civilized and modern times. For instance :—

“ By my physician’s learned advice I fly
From Bain’s waters.” *

But where ?

Sometimes the physician sent his patients to undergo hydropathic and bracing treatment :—

“ While the sick folk in Clusium’s fountain dare
Plunge the cold head or seek a colder air.” *

But at others it was a sheltered nook they must have needed, for although the climate of Italy—the land of the olive and myrtle—is deemed to be the abode of zephyrs, the reverse is often found out to be the case, and Celsus himself gives a thoroughly British description of the north-east wind :—*Aquilo tussim movet, fauces exasperat, ventrem adstringit, urinam supprimit, horrores excitat, item dolores luteris et pectoris.* If Celsus sent his patients to the sea-side, it seems that sometimes they required a compensation which is not unknown at the present day :—

“ At the sea coast I shall expect to find
My wines of genuine and of smoother kind.”

There is nothing new under the sun. Luxurious extravagance and want usually run side by side. We know the Roman rulers had to

* Francis’s “ Horace.”

provide bread for the poor—*panem et circenses*—but the latter our poor laws do not supply. Luxury and penury alike lead to disease; the happy medium between the two to health; and I am rather under the impression that through the influence of hard times the pharmacist of the present day is suffering from a turn in the tide tending towards moderation.

The first book of Celsus treats of general regimen for healthy people, with special instructions for the treatment of small ailments. Some of these directions were rendered necessary by the luxury just spoken of; for instance, the custom of vomiting after meals. Celsus tells us that the Greeks divided medicine into three branches: the first, dietetic; the second, pharmaceutical; the third, surgical. The next book treats of the prognostics of disease and its treatment by the dietetic method, with copious information respecting the various foods and their proper use. Celsus also makes a variety of observations respecting seasons, winds, age, temperament, and other conditions of health. One passage struck me as of interest to middle-aged philosophers like ourselves, *At etas media tutissima est, quæ neque juventutis calore, neque senectutis frigore infestatur*. There is much discretion and sound sense in the description of the various foods, both animal and vegetable. Generally speaking foods may be said to have not more than a personal interest for pharmacists; but special aids for the digestion are attracting present notice, and with respect to farinaceous foods it is probable that more may yet be discovered as to suitable dietetic mixtures of these aliments. The Romans used a variety of cereals, as foreign wheat, winter wheat, siligo, a second kind of wheat, rye, barley, oats, rice, panick, and millet; and of legumes beans, peas, lentils and lupins. Some of these were of good juice (*boni succi*), some of evil. Of flours, may be mentioned siligo and pollen, varieties of fine flour, amylum, whole meal, bran and fur, which was perhaps a kind of groats. Alica, a preparation of much repute, was made of rounded grains deprived of husk and whitened with chalk for use, sometimes ordered washed. It was said by Pliny to be obtained from a plant called *zea*, and is translated maize; but this cannot be correct, as maize is a native of South America. I would refer those who desire more information to the book itself, but they must remember that lentils and whole meal have been appropriated, the former at least to somebody's advantage. *Sorbitio*, slops or gruel, and *ptisan* (barley water, etc.), were favourite remedies. The latter name has been preserved by the French in their tisanes, but has been abandoned on this side of the channel. In dealing with

farinacea we arrive at the directions for the cataplasms or poultices, of which there is more variety than now employed. *Cataplasmata* are directed to be made with flour, fine or coarse; and with barley, vetch, darnel, millet, panick, lentil, bean, lupin, linseed, or fenugreek meal, boiled and applied hot; besides which a variety of drugs are employed to render them emollient, rubefacient, or stimulant. *Gestation*, that is, exercise of divers kinds, friction, fomentation, baths, etc., are hardly pharmaceutical remedies, but clysters were administered, some of which were the same as are now used.

The fourth book is more purely medical, and treats of diseases of certain parts of the body; and catarrh being considered a local disease, we light upon the word *destillatio*, which suggests an interesting comparison between the use of words adopted in modern times from the Latin, and the original meaning of the same words in the Augustan age. I may remark that this work of Celsus was the mine from which the medical writers, on the revival of learning, drew their medical Latin. In the word *destillatio* the allusion is to the humour which distils into the nostrils, distillation being synonymous with catarrh. The word *destillatio* is several times used, *mutatis mutandis*, with a like meaning, and in no other sense. *Pulvis*, as might be expected, is used with its proper and present meaning, but *tinctus* (the word *tinctura* does not occur) is used only in the sense of dipped, as in the case of water into which a smith's hot iron has been frequently dipped, which is said powerfully to affect the spleen. *Decoctum* continues as of old, *decocta* being numerous, but all extempore preparations. *Infusum*, however, is only used with its original meaning of pouring upon, as cold water poured upon the head. Neither *liquor* nor *solutio* are used in our technical sense, or in any way approaching to it; the term liquid, as distinguished from solid, is of course frequently to be met with. Probably at a much later period solution of any principle in water was, as we shall presently see, but little understood. In like manner *essentia* is something new altogether. The word *extractum* occurs a few times, and in the preparation of *Arteriace* I thought I had met with its use in the modern sense. Certain preparations are directed to be boiled "*donec extracta inde gutta indurescant.*" But I was too hasty, it was not the pharmacist's technical meaning. *Spiritus* is used only in the sense of breath or breathing, wind and air; what may be termed the spirituous application of the word did not then exist; it evidently grew out of the sense of something purified, refined, or ethereal. I may remark in this connection that the name *fermentum* was given to yeast. The word *pilula* is not to be

met with, though we may find pills under another name; it is used by Pliny, and is the diminutive of *pīla*, a ball; singularly enough *pīla* is a mortar. The word *linimentum* did not yet exist; but there are liquids "*quæ illinuntur*," a direction still given by physicians. These liquids, Celsus tells us, were called *enchриста* by the Greeks, a word still surviving in christen, which means to anoint rather than to sprinkle. The word *linamentum* signified lint or linen, *linteum* being a word also used. *Collyrium* was used in a somewhat more extended sense than that of "eye lotion," as will be presently explained. *Gargarisma* is not used, but the verb from which it was derived is to be frequently met with.

Referring to the general subject of the book, we find that for the diseases described special medicines and treatments are directed. Amongst the medicines occur the standing formulæ, and also a variety of extempore preparations; amongst these may be mentioned some to be taken internally, as decoctions and the juice of fresh plants. One preparation is still known and has not altogether lost its popularity, that is *acetum scillæ*; this, however, was no baby in the time of Celsus, as it was said to have been used by Pythagoras five hundred years before.

We now arrive at the fifth book, where, having left the region of dietetic treatment, which, however, includes, as we have seen, the use of a number of medicines, Celsus enters upon the consideration of diseases more usually combated with the aid of drugs. Erasistratus, he says, and others who styled themselves empirics, put great confidence in medicines, but Asclepiades, for whose opinions Celsus seems to have had the greatest respect, pretty much laid aside the use of them—"with some reason, as most medicines offend the stomach, affording bad juices,"—and turned his attention to the food (*victus*). Celsus, however, judiciously advises either class to look to both means of cure, and as medicines have peculiar powers, he commences by reciting their names and virtues. This sketch being specially intended to bear upon the history of pharmacy, and not upon that of *materia medica*—a wider and more interesting subject—I will merely allude in general terms to the substances mentioned in the text.

In the first place drugs are classed under their respective properties and uses, and it is rather a surprise to find that these generally have reference to their external action upon the body, but we may remember that the very earliest allusions we have respecting pharmacy are to ointments. For instance, in Exodus xxx. myrrh, cinnamon, calamus, and cassia, with olive oil, are to be obtained,

"and thou shalt make it an oil of holy ointment, an ointment compound after the art of the apothecary." That enterprising lady, Medea, also compounded an ointment to render Jason invulnerable. Other instances might be given. So Celsus introduces styptics, vulneraries, digestives, cleansers, rodents, caustics, resolvents, and so forth.

Aperientia open mouths in bodies, which the Greeks call *stomata*. *Purgantia* purge wounds and not bowels. Let me give one short section by way of example of the drugs used, that of "evacuants and drawing remedies," viz., ladanum (*Cistus creticus*), round alum, omphacium (verjuice), gall, chalcitis (copperas), bdellium, turpentine, and pine resin, propolis (bee glue), dry figs boiled, dove's dung, pumice, meal of darnel, green figs boiled in water, elaterium, bay berries, nitre (soda?), and salt. Although in this synopsis of the *materia medica* allusion is made almost exclusively to the external application of drugs, it must not be supposed that such was then their only use; for instance, in the previous book a long list is given of diuretics to be taken internally, and we shall find similar examples in the list of preparations. Celsus mentions from first to last perhaps four hundred drugs. Many of these have continued in use to the present day, and the list contains some of our most valuable drugs, as scammony, aloes, opium, hyoseyamus, cantharides, ammoniacum, etc. It will be remembered that the Mediterranean coasts produced many species of drugs, and that the east, with its aromatics, its gums and balsams, was open to the trade of Europe through Antioch and Alexandria. Amongst the minerals mentioned are metallic earths and oxides, mostly native, but some produced, and which include in some shape or other arsenic, copper, lead, iron, zinc, and antimony. Silver and gold were not officinal, but the latter was used for fastening loose teeth. Soda, potash, and lime were the alkalies, acetic the only acid. Wine is freely used both on its own account and as a vehicle. *Passum* (a kind of raisin wine) and *melsum* (hydromel) were also freely used. Most of the articles are well known and identified, others doubtful, whilst of others, as Targa, one of the editors of Celsus said: "*Qui monstrabit quid sit erit mihi magnus Apollo*;" pondering on which passage led me to think of the honours now bestowed on pharmacists—one may by chance get a degree *honoris causâ*, or a phenomenal F.R.S. Something between a profession and a trade, there is not even a doctorate of pharmacy.

Pharmaceutical preparations are naturally introduced by a summary of the weights and measures used in compounding them. The

ounce is divided into seven denarii of about 62 grains each, and the denarius into six sextantes, a sextans being equivalent to the Greek obolus, or a little more than $\frac{1}{2}$ a scruple.

Simplicia, simples, is the name given by Celsus to un-compounded drugs, a designation that lasted longer than the day when Shakspeare wrote of one "culling of simples," but now seems to have disappeared. Celsus says, "*sæpe simplicia opitulentur, sæpe mixta*," and in this last word, compounding of simples, lies the chief of the pharmaceutic art, the culling being left to others. Perhaps it is vanity to magnify our office; this designation of its duties reads simply enough, the words run smoothly; but he that has practised pharmacy alone knows its sinuosities and responsibilities. I say sinuosities, which may seem an odd word to use, but pharmacy, more than most professions, requires of its follower knowledge both in the highways and byeways of learning, and he often has to deplore, to himself at least, his ignorance, whilst he may apply to his profession the well-worn quotation—for did not Hippocrates, the father of medicine, originate it?—" *Vita brevis, longa ars.*"

To recur to the text. External applications, as may be expected, are most prominent. *Malagnata* have the first place. A malagma was a plastic application; something between a plaster and a poultice. There are thirty-six formulæ given, some of them being named according to their properties, as malagma for pleurisy, for the gout, the liver, the spleen, etc., whilst others bear the name of their inventor, as Moschus, Chrysippus, Ctesiphon. Next come plasters, "*emplastra*," twenty-nine kinds. Some of these have had for their basis litharge (*spuma argenti*) and olive oil; and it is directed that when these are ordered they are to be boiled together, so that we follow in making our plasters the method employed at Rome eighteen hundred years ago. Special qualities are given by the addition of verdigris, minium, galbanum, cerussa alba, etc. Basilicon is older than the image of the Royal Stuart, with which I had associated it; its formula is panax—perhaps opoponax—galbanum, pitch, resin, and oil. Then come pastils (*pastilli*), which the Greeks called *trochiskous*, in which we follow the Greeks, cutting off the tail of the word for the sake of euphony. Pastils or troches are made of dry medicaments, mixed up with a liquid not greasy, as wine or vinegar, and afterwards dried. When used they are to be moistened with the same liquid. There are seven kinds, six of which are to be applied externally; but the seventh is to undergo what we consider to be the legitimate disposition of such named remedies. This kind is for the stone, and as the formula and directions for use are

given after the manner of a modern prescription, I will quote in full the classic Latin of Celsus:—" *Cassiae, croci, myrrhæ, costi, nardi, cinnamomi, dulcis radices, balsami, hyperici, pares portiones conterentur; deinde vinum lene instillatur, et pastilli fiunt, qui singuli habeant P. X = (sextantem) hique singuli quotidie mane jejuno dantur.*"

Next come pessaries (*pessi*). These remedies have of late had considerable popularity; but the pessaries of Celsus had soft wool as a foundation, which was saturated with some oleaginous or other preparation, of which there are nine kinds; the last, if effective, though costly, might be worth notice, "*si non comprehendit, adeps leonina ex rosa (ol.) mollienda est.*" These are followed by compound powders, all for application, except a sternutatory, of which white hellebore is the basis. Gargles are described, and the formulæ of antidotes are given. Of these the most celebrated is Mithridates, by taking which daily the monarch of that name secured himself against the danger of poisoning. This medicine survives to our day; but its glory has departed. *Acopa* are a species of liniment. *Catapotia* are the predecessors of our modern pills. No directions are given for dividing the mass when made, the only instructions being that the size of a vetch seed, a pea, a bean, an Egyptian bean, or a lupin, as the case may be, is to be gulped down (*devorasse*). One formula is anodyne, in which *papaveris lacrima* is directed to be used, and in a second for a cough—*Athenionis*—the same drug is directed to be used, and two *catapotia* the size of our bean (*fabe nostræ*) are to be taken morning and night. This dose would be equivalent to 20 grains or $2\frac{1}{2}$ grains of opium, which indicates some discrepancy of weights. The same discrepancy is shown in the dose of elaterium as given by Dioscorides, viz., an obolus, which, if the strength were the same as at present used, would probably be an obolus for Charon. A few miscellaneous preparations conclude the list of regulation formulæ. In the next book is a long list of *collyria*, of which many are solids, to be dissolved or used as a *penicillium*, as the case may be. I have now brought to an end my brief sketch of the Pharmacopœia of Celsus. If I have made mistakes in rendering it, I trust I may be forgiven. I have met with some myself. For instance, Celsus tells us that if a *sanguisuga* be swallowed, salt and vinegar should be given. One editor says, *apropos* of this, that in every other place Celsus calls the leech *hirudo*. I take another edition with a good index, and find six references to *hirudines*, but as they all prove to be *hirundines*, much more agreeable animals, I am still in doubt as to whether Celsus "ordered leeches." I could mention other discrepancies; but, as I say, I ask easy measure for myself.

There is yet a practical phase that neither physician, pharmacist, nor the public would let pass in those days any more than in these present, namely the pecuniary, and we find it treated of in Horace :—

“ ‘ Take the ptisan ! What will it cost ? ’ ‘ Nay, hold,
A very trifle. ’ ‘ Sir, I will be told. ’
‘ Threepence. ’ ‘ Alas, what does it signify,
Whether by doctors or by thieves I die ? ’ ” *

The ptisan of the text was rice water ; but advice might have been included. It is the old story, he spends a fortune over a dish, but grudges eight asses, say sixpence, for being cured of the effects of it.

Let us again take up the history of pharmacy. After a lapse of one thousand six hundred years great and mighty changes had come over the world. Pharmacy had also experienced its vicissitudes. Many searching spirits had arisen, and a new science was being unfolded to the world by a name unknown to Celsus. Alchemy and chemistry were born and grew together. With their history are associated the names of Basil Valentine with his “*currus triumphalis antimonii*” and his discovery of sulphuric acid, Raymond Lully, Roger Bacon, Albertus Magnus, and that prominent and burly figure Paracelsus—

“ The wondrous Paracelsus, the dispenser
Of life ; the commissary of fate, the idol
Of princes, —— ”

the destroyer of Galenism and a man of great genius, but a most egregious quack ; author of a new medicine and a new theology ; commonly believed to possess the double tincture, namely, the power of transmuting metals, and of curing diseases. Not much of his own survives, but appropriators have made good use of his ideas. Henceforward we have chemical as well as galenical remedies. The times had been strange, wild, and irregular. Magic, superstition, and astrology had a hold upon physic, as upon most things spiritual and temporal. Things medical, as things in general, were, however, now gradually improving in most countries in Europe, and in 1618 was issued the London Pharmacopœia, henceforth to be the law of the pharmacist. In early times it had a hard struggle to hold its own ; the old views of things survived, new heresies arose ; it followed but did not lead, but in following began the ascent to the proud position the British Pharmacopœia now occupies. It is not, however, to the Pharmacopœia Londinensis, but to the pharmacy

* Francis's “Horace.”

of the times, irregular perhaps, that I wish to call your attention for a few minutes, and this is to be found in the dispensaries.

A famous dispensatory of the seventeenth century was that of Dr. William Salmon, Professor of Physick, who lived "at the Blew Ball by the ditch side nigh Holborn Bridge," which went through many editions. It is professedly a translation of the *Pharmacopœia* with explanations and commentaries, and a dictionary of the *materia medica*. The doctor is not afraid to make animadversions upon the work of the august fellows of "the Colledge," which it appears was lately reformed. For instance, there follows the directions for melilot plaster:—"A learned but long discourse, the Colledge here talks almost like an apothecary as the vulgar phrase is; but not half so well." An interesting phrase this, and by the way, the apothecaries must have taken the ability to talk with them when they went over in 1815. Men were outspoken and hard hitters in those days, the amenities of life were less understood than at present. This may be termed the redundant age of pharmacy. The revival of learning had brought forward all the old knowledge stored up in the pages of Pliny, Galen, and Dioscorides, and other ancient writers. In England, Gerard, Parkinson and the herbalists were opening these stores to the public view; as Salmon says, "In the very best authors extant a great part are collections," a fact probably true of many authors of the present day. Chemistry had begun to contribute its share. Superstition had not died out, cures being still performed "astrologically, galenically, and chymically." Not long before this, Jerome Cardan, the first physician of his time in Europe, professor of mathematics and a philosopher, was accustomed to draw the horoscopes of his patients, and himself believed in them. The conflict between the old and the new, between rationalism and dogmatism, had commenced even in pharmacy, but as yet that science was blessed with a superabundance of material.

Salmon himself was a bit of a quack, even as the times went. I will give a slight sketch of his book. The first book treats of simples—the vegetable *materia medica*; the second of animals, including man, birds, beasts, serpents, insects, and fishes. Many of the substances mentioned are preparations, not simples. Man's body, living or dead, affords thirty-nine medicaments, so it may readily be imagined that hardly a bone or tissue, a secretion or excretion but plays its useful part. A list merely would be amusing reading, but hardly fitted to the proprieties of the present day. So through the whole zoologia, the obscene preparations, of which we

find a few even in Celsus and many in Dioscorides, were in full force; and it is odd to figure to oneself the disgusting compounds that may have been swallowed by the good people whose lives we read the story of, as well as by the wicked and the great unwashed. *Tempora mutantur et nos mutamur in illis*; the fastidious tastes of those days were probably very different from the fastidious tastes of the present day. Custom reconciles men to strange performances. Francis Rabelais was a physician, and there was a good deal of the grotesque spirit of pantagruelism about middle age medicine.

Next follows the mineralogia, and then the preparations of the Pharmacopœia, translated and copied with considerable comments and additions. These are divided into compounds internal and compounds external, and we now meet with the names that are still in use in the present day. A few have fallen out of use, as magisteries—precipitates both mineral and vegetable—except that perhaps now and then the magistry of bismuth is heard of. Quidonies, kinds of rob or syrup, apparently pleasant preparations, have disappeared altogether, and lohochs survive only in the lohoch sanum, a name which in my district is curiously modified so as to have caused a totally different preparation to be substituted. But I would here remark that the fine old remedies and recipes that people used formerly for their minor complaints have very much succumbed before those all-promising but mostly delusive shams called patent medicines.

The next book treats of the "Practice of Chymistry," and has chapters on principles, instruments, dissolution, sublimation, etc.; that on fermentation is as follows:—"Fermentation is a certain manifestation of life fitting it for a resuscitation, and without which it would remain captivated within the bonds or chains of death; or, it is the breaking of the bond of corruption and putrefaction by the power of life assisted by a homogene matter or principle already freed." Quincy, who wrote perhaps fifty years afterwards by the light of his modern days—Quincy, whom in my junior days I always considered to be the grandfather and general ancestor of pharmacology, because his was the oldest book upon our shelves—remarks, quoting the passage: "And what confused stuff is this from Salmon!" But is there so much fault to be found with it? The modern problems of biology were very far beyond Quincy's ken, who proves fermentation to arise from unequal specific gravities—a sort of "here we go up, up, up—there we go down, down, down" process; but Salmon seems to have had a glimpse, if but a hazy one, of the truth, and if he wrote most delicious non-

sense upon many subjects, it may at least be said for him that on this he wrote what may well pass muster with much that is termed speculative philosophy in the present very modern times.

I shall not trace my way to the pharmacy of the present day by the direct path, but will just touch upon a work or two that indicate the way in which the old follow-my-leader style of writing gave place to that which culminated in "Pharmacographia." Remedies from newly discovered lands must necessarily be treated *de novo*. As early as 1661 a beautiful little book was published at Venice, written by Gandentius Brunacius, "De Cina Cina seu Pulvere ad Febres." I said newly imported drugs required new treatment; this is true to a certain extent, but yet this author is soaked through and through with the old ideas. He tells how the bark was introduced, and then he discusses its nature, and through the book as far as I have read it dwells at intervals upon this one theme, which evidently embarrasses him, viz., its quality of heat and dryness. Galen gives every plant its four degrees of heat or cold, dryness or moisture, and almost every writer down to a later period than this follows him. How they found them out would take a *magnus Apollo* to tell. What is cold and dryness? Is it a positive quality, as Galen has it, says Brunacius, or is it, as Cardan, in his book "De Subtilitate" (on final causes, etc.), says, a mere absence of heat? Author after author amongst the ancients is quoted, and logical proofs are given, illustration after illustration, but still he is not satisfied. How heat can exist in wood is a problem in physics he cannot clearly comprehend, though he calls to his aid the case of the burning mirror, by which the vestal virgins rekindled the sacred fire, the case of the Apulian rustics who produced fire by the friction of dry sticks, and that of the hair-cutters, who say their instruments draw sparks from the heads of their clients. Then further, how the heat or the cold of the bark acts upon the heat or cold of the fever, though puzzling, is a question that it becomes a "Syntagma Physiologicum" to answer, and it is done accordingly. After this, we have the pharmacy of the drug, and the ninth chapter treats and proves very satisfactorily to our author "why cina cina should be given infused in wine;" on the other hand, the next chapter answers the question whether cina cina should be exhibited in water in the form of infusion or decoction, and the answer given in the first line reminds me of *Punch's* advice to people about to marry, *Respondeo neutro modo esse præbendum*, and the reason follows, that decoction in water takes away the strength of medicines so prepared. This book must be

one of the earliest extant specially treating upon cinchona, and it fixes the date at which it was brought to Rome to Cardinal Lugo by the Jesuits as the year of jubilee, 1650.

In 1681 was issued "A New Mystery in Physick discovered by Curing of Fevers and Agues by Quinquina or Jesuites Powder." This is a little book translated from the French of Dr. Belon, preceded by an introduction by an English author which contains a great deal of very curious chemistry. Although but a few years had elapsed since the former work, either the time or the place of writing has caused a wonderful difference in the treatment of the subject. The ancients are altogether left out of consideration, and a much more rational view is taken. The pharmacy is extended, wine is still the favourite vehicle, but there are also tincture, extract, infusion, pills; altogether the book reads much more pleasantly than the stilted English works of the same period. One step more, and in 1769 we are landed in the gentle and respectable sobriety that characterized the pharmacy and materia medica of this present age, until brightened by the influence of Dr. Pereira, and this step we take in the company of Dr. Canvane of Bath, whose dissertation on the *Oleum Palmæ Christi* reached a second edition in 1769. There is a little bit of history in the announcement that "the oil since my first publication of this pamphlet is now become officinal, it being sold at the Apothecaries' Hall and several other shops in London and Bath," but it may be added that this was rather a late introduction, as the seeds were used by Hippocrates 1200 B.C. Dr. Canvane deals most fully with the therapeutical value of the oil, but he does not forget the pharmaceutical, and he introduces us to "the uncomparable Dr. Huxham of Plymouth," whose name is, I fear, gradually being forgotten by pharmacists. Not so that of Mr. Goulard, who flourished the triumphant motto "*Redeunt Saturnia Regna*;" the extract of Saturn is forgotten, but as Mr. Goulard's extract it survives, and if his name is "written in water," it is also written in lead. Mr. Goulard's work is well known; but the three others I have alluded to, especially the first, are, I believe, of considerable rarity.

I have now brought to a close my sketch of a few aspects of the history of Pharmacy. My original intention was also to have said something of the pharmacy of the present; but I have already had to cut my story short. Whether many pharmacists can find time to trouble much about the pharmacy of the past when that of the present gives them so much to think of, is perhaps rather doubtful; but there is at least considerable interest of a quaint sort to be

gathered from it, and I cannot but think that if the history of pharmacy, which has not yet been written, were well put together, it would be worthy of the doing.

If pharmacy advanced slowly, the same may be said of medicine, which from the time of Galen to the sixteenth century gathered little or nothing but the dust and cobwebs of scholastic theories. Then the sap began to flow in the barren stems of many sciences. Pharmacy was benefited by the advance made in natural philosophy and chemistry, and chemists of repute were found in the rank of its followers. It for long, however, occupied but a second place as a subsidiary branch of medicine, and it was only in the present century that it first stood alone. Since then its growth has been rapid, a constant process of evolution and survival of the fittest. Its scientific history is written in the Year-Books of this Conference, and in the Journals of the Pharmaceutical Society, and its commercial, for it is a commerce, in the painstaking and moderately rewarded lives of its numerous followers.

Mr. GROSE (Swansea) moved—"That the best thanks of the members of the Conference be given to the President for his very valuable and instructive address.

Mr. GREENISH (London) in seconding the motion, said he would only refer to the passage in which allusion was made to the late Mr. Stoddart; those who had been in the habit of attending these meetings, and were at all acquainted with Mr. Stoddart, must heartily sympathise with what had been said.

Mr. HUGHES (Llandilo) having supported the motion,

Mr. BRADY, as Senior Vice-President, put it to the meeting, when it was carried unanimously.

The reading of papers was then proceeded with.

The first paper read was a—

REPORT ON THE ACONITE ALKALOIDS.

By C. R. ALDER WRIGHT, D.Sc. LOND.,

Lecturer on Chemistry in St. Mary's Hospital Medical School; and

E. H. RENNIE, M.A., SYDNEY, D.Sc. LOND.,

Demonstrator of Chemistry in St. Mary's Hospital Medical School.

The alkaloids contained in 300 lbs. of fresh aconite herb (*A. Napellus*), grown at Foxton, in Cambridgeshire, were isolated by the methods described in last year's report, viz., crushing, maceration

in alcohol, expression of extract, evaporation to a smaller bulk, and treatment of the liquid (weighing about 59 lbs.) with soda, and repeatedly shaking with ether. A quantity of alkaloidal matter was thus readily dissolved out, a small portion remaining permanently dissolved in the alkaline fluid, in a form difficultly soluble in ether; the alkaloidal matter thus retained yielded nothing crystalline on precipitation with mercurio-iodide of potassium and treatment with sulphuretted hydrogen, and appeared to be all but destitute of the characteristic physiological action of aconite, producing little or no tingling of the lips when applied thereto. It greatly resembled the corresponding substance similarly obtained from the extracts derived from the various kinds of aconite roots examined in previous reports, consisting of a mixture of amorphous bases of lower molecular weight than aconitine, some of which differ therefrom markedly in being readily soluble in caustic and carbonated alkalies, and in being only imperfectly removed from such solutions by ether.

The alkaloidal substances dissolved out by the ether treatment, being mixed with a large quantity of greenish soft resin, were separated therefrom by agitation with tartaric acid solution and separation of the tartrate solution thus formed; on treating this with sodium carbonate and ether, about 15 grams of alkaloids were finally obtained by the spontaneous evaporation of the ethereal solution. No artifice employed was successful in making this product crystallize or yield crystallized salts of any kind; it appeared, however, to contain a notable amount of aconitine, producing an energetic action on the lips when cautiously applied thereto, though it was by no means so powerfully active as pure aconitine. On combustion it yielded the following numbers, indicating, as did also its physical properties, that it was substantially the same mixture of alkaloids as that occurring in *A. Napellus* roots, only differing therefrom in containing a smaller percentage of aconitine, the quantity of uncrystallizable bases being relatively much larger.*

(1) .2845 gram of substance dried at 110° gave .6735 C O₂ and .217 H₂ O.

.459 gram of substance burnt with soda lime gave .01222 N.

A portion of the substance was dissolved in dilute hydrochloric acid, and the solution precipitated by slow addition to a dilute

* It would seem to be highly probable that the presence in excess of non-crystalline bases, preventing crystallization of what aconitine is present, is the main cause of the difficulty which we understand is sometimes experienced in isolating the crystallizable alkaloid from *A. Napellus* roots in the process of manufacture on the large scale.

solution of sodium carbonate; the flakes thrown down after collection and washing, gave these numbers:—

(2) .290 gram gave .694 C O₂ and .195 H₂ O.

.387 gram gave .00993 N.

	(1)	(2)
Carbon	64.56	65.26
Hydrogen	8.47	7.47
Nitrogen	2.66	2.57

The sodium carbonate solution contained about a gram of a soft alkaloid readily soluble in alkalies and for the most part soluble in water, and but sparingly soluble in ether, doubtless, therefore, consisting largely of aconine, either produced by the saponification of aconitine during the process of working out the bases present in the herb, or else originally present therein.

The above numbers and general results are practically identical with those obtained from the mixture of aconitine and uncrystallizable alkaloids accumulating in the mother liquors from which the aconitine from *A. Napellus* root (described in report, 1877, p. 461), had separated by crystallization, two samples of them giving the following numbers:—

Carbon	65.80	65.46
Hydrogen	7.78	7.58
Nitrogen	2.71	3.05
Benzoic Acid formed by saponification	14.4	14.1

On boiling up the mixture of alkaloids (1) above, benzoic acid was formed to a somewhat greater extent than with these two samples; 2.227 grams gave of purified acid, by titration .3904 grams, by direct weighing (including a minute amount of resinous matter), .397 gram.

By titration	17.5
By weighing	17.8

The benzoic acid produced melted at 120°; it gave no trace of coloration with ferric chloride after fusion with caustic potash at 250°, acidulation, and treatment with ether; whence evidently no veratric (dimethylprotocatechuic) acid was present, and therefore no pseudaconitine was contained in the herb employed.

Hence it results that the quantity of active alkaloid contained in the aconite herb is probably somewhat less than that contained in the roots, reckoned on the dry substance; for a quantity of roots was found (Report, 1876, p. 539) to contain about .07 per cent. of

total bases, of which aconitine constituted so large a proportion that about two-fifths of the total alkaloid was obtained as pure crystallized aconitine. Admitting the 300 lbs. (or about 135 kilos) of fresh herb to represent one-fifth of that amount of substance in the same state of dryness as the roots (an estimate probably in excess of the truth), the total yield of alkaloids readily soluble in ether being about 15 grams, this would represent about .05 per cent. of total alkaloids contained in the dry herb; the percentage of aconitine in this amount of total alkaloids being much less than that in the root alkaloids, so that the relatively large amount of non-crystalline bases wholly prevented crystallization.

It can, however, hardly be concluded, from these two cases, that it is a general rule that aconite roots are richer in crystallizable aconitine than the dry herb; for we are informed by Mr. John Williams, that it has sometimes happened in his factory that no crystallizable aconitine at all, but only non-crystalline bases, could be isolated from batches of roots worked up on the manufacturing scale in precisely the same way as other batches which readily yielded crystals; whence it would seem that the roots occasionally are either poorer in aconitine or richer in non-crystalline bases than those described in the Report for 1876; and it is therefore much to be desired that further experiments should be made as to the quantity of crystallized aconitine that can practically be isolated on the manufacturing scale from roots of various ages and grown in different soils and climates, etc. Such experiments as these, like the analogous questions as to what precise method of manipulating and what menstrua will best suffice on the large scale to separate aconitine economically from the non-crystalline alkaloids accompanying it, cannot readily be carried out by the scientific chemist working in his laboratory on a comparatively small scale; but they are indispensable in order to put the economical production of crystallized aconitine on a sound commercial footing.

At the present moment the pharmaceutical aspect of the production of aconitine is as follows. Prior to the last eight or ten years the term "aconitine" was applied to an amorphous alkaloidal substance extracted by processes investigated by Von Planta, Geiger, and Hesse, and other chemists from *A. Napellus*, and probably mixtures of that and other species. During the last decade the experiments of T. B. Groves and Duquesnel, together with those carried out by the aid of the Pharmaceutical Conference grants by Alder Wright, and collaborators, and described in the series of reports of which this is the concluding one, have demonstrated that

the active alkaloid of *A. Napellus* (to which for some years the name "aconitine" has been restricted) is a definite crystallizable substance occurring naturally intermixed with larger or smaller quantities of amorphous bases of much less highly active characters, and is readily split up by various chemical reagents into benzoic acid and a base (aconine) comparatively speaking inert: the want of uniformity in physiological action of the product obtained by processes such as those employed by the older chemists being due partly to the presence of variable quantities of the natural amorphous alkaloids co-existing with aconitine, and partly to the decomposition of a large portion of the aconitine originally present by the action of the particular chemicals and mode of treatment employed during the extraction operations. Further, the relationships of this aconitine to other analogous aconite alkaloids derived from other species (*e. g.*, pseudaconitine from *A. ferox*), and to organic bodies generally have been attentively studied.

As a consequence of these experiments a demand for pure crystallized aconitine has sprung up, more especially in America, the object being to replace the amorphous unreliable preparations generally met with in the market by the pure uniform alkaloid; but at the present moment this demand is to a great extent unsatisfied, because whilst the supply of *A. Napellus* of American growth is too limited to enable American drug manufacturers to prepare the pure alkaloid themselves, its manufacture in Europe has not yet been carried out to any considerable extent; from whence it results that whilst the Committee of the American Pharmaceutical Association on the Revision of the U. S. Pharmacopœia is desirous that the forthcoming new edition of that Pharmacopœia should exclude the amorphous preparations and should define aconitine solely as the crystallized uniform body $C_{33}H_{43}NO_{12}$, described in detail in former Reports to the Pharmaceutical Conference,* yet it appears at present somewhat doubtful whether it will be practicable for this desire to be carried out, simply because this pure article is not to be found in the market, at any rate to an extent at all comparable with the demand for it.

* For an epitome of the characters (physical and chemical) of aconitine and other allied aconitine alkaloids, *vide* the *Pharmaceutical Journal*, July 3rd, 1880, and following numbers, in which some points connected with the practical economical side of the question are discussed, the origin of these communications being an application to the subscriber by Dr. Charles Rice, Chairman of the Revision Committee of the U. S. Pharmacopœia, for a *précis* of the characters of aconitine, and other information concerning it, for the guidance of the Committee.—C. R. ALDER WRIGHT.

Professor ATTFIELD said the Conference should not lose sight of the question raised by Dr. Wright as to the influence of age, climate, and soil on the quantities of active matter present in the aconite; nor of the other point raised, as to the best mode of commercially manufacturing the alkaloid. It might be a question whether the latter matter should be left now to commercial enterprise, or whether the Conference should do any more in that direction. Experiments respecting the influence of soil and climate on plants required a great deal of time and a great deal of money; but as had been already intimated, the Conference had money to spend on these very matters, and it seemed a pity that this question should be finally disposed of in this concluding report by Dr. Wright. At any rate, he hoped the matter would not be altogether lost sight of.

Mr. SCHACHT said he should like to lay stress on one observation made by Dr. Wright, viz., that the crystallizable principle in these solutions was rendered more difficult of crystallization by the presence of uncrystallizable matter. It occurred to him that that was somewhat opposed to one's usual experience in such mixtures, and he ventured to ask if it was one which other scientific chemists would be prepared to endorse. Dr. Wright was so shrewd and able a man that one would like to receive everything he suggested, even a scientific guess, with great respect, but it seemed a little outside his own experience at any rate.

Mr. UMNEY, though he had had no experience in this particular alkaloid, had found in the quinine manufacture, when the mother liquor contained a large quantity of crystallizable alkaloid, it was most difficult to crystallize it when the amorphous alkaloid was also present. He had no doubt there was the same difficulty in crystallizing sugar when there was a large quantity of treacle present. At any rate, he could speak positively as to the cinchona alkaloid.

Mr. GERRARD said he could corroborate Mr. Umney's statement with regard to another alkaloid, pilocarpine, and also eserine. He had found great difficulty in crystallizing the eserine salts he had prepared in the presence of some amorphous or syrupy bodies. There seemed some amorphous bodies present generally in some plants, which when evaporated to a certain extent greatly retarded crystallization.

Mr. REYNOLDS said there was another view of the case, and that was the possibility of a still more serious condition of things, the conversion of the crystallizable alkaloid into an uncrystallizable product. He thought this might be possible under some circumstances which had not been sufficiently studied.

Mr. SCHACHT said that was just the point he was urging the solution of.

Professor ATTFIELD said the uncrystallizable matters, so called by Dr. Wright, were simply those which he had not yet succeeded in crystallizing. It might be, when better methods of separation were devised, much of this matter would turn out to be crystalline, and, being separated, not prevent, to the same extent as at present, the crystallization of the true aconitine. If it were necessary to give any further answer to the question raised by Mr. Schacht, he might say that several years ago he did a great deal of work in the crystallization of matter from fluids obtained from herbs, and his almost constant experience was that syrupy fluids of that kind did yield crystals very easily, and which looked very beautiful, but they always turned out to be sulphate of lime; whereas the alkaloid and organic matter which he was in search of were considerably retarded in crystallization by the presence of uncrystallizable matter.

Mr. REYNOLDS remarked that old pupils of Dr. Pereira would no doubt remember one of his stock stories, that when Dr. Thomson's collection of alkaloids was examined, the crystals unfortunately turned out to consist largely of sulphate of lime.

Mr. GREENISH had observed that in a large number of roots of aconite a change had occurred which was probably due to the conversion of starch into a gummy body. This applied more to the *A. ferox*, which came from India, than to the *A. Napellus* grown in Germany; he had found it occur in the latter, and it sometimes made the whole root so hard that in making sections it actually turned the edge of the knife. Whatever this hard substance was, he could only recognise it as some gummy body; it might interfere very much with the crystallization of the alkaloid.

The PRESIDENT said a vote of thanks was due to Dr. Wright for his very able paper.

The next paper read was entitled—

NOTES ON THE ESSENTIAL OIL OF BUCHU LEAVES.

BY PROFESSOR FLUCKIGER.

If thin layers of buchu oil are exposed to spontaneous evaporation, a crystallized substance makes its appearance. On submitting 35 kilograms of round buchu leaves to distillation (*Barosma betulina*), I obtained 180 grams of essential oil, *i.e.*, a little more than $\frac{1}{2}$ per cent. From this the crystals can be extracted by means

of caustic lye. The oil repeatedly shaken with an equal volume of soda lye, 1.14 sp. gr., forms a yellowish turbid mixture soon separating into two clear layers (A) and (B). The heavier (A) then displays a bright red colour; it should be washed several times with ether, in order to remove that portion of the oil which is simply dissolved in, not combined with, the alkaline liquid. One volume of the washed portion (A) is then diluted with four volumes of alcohol, sp. gr. 0.83, and neutralized with an acid, either sulphuric, acetic, or carbonic, when an oily layer separates. In a couple of hours or sooner it concretes, and affords a crystallized mass of what we may call *diosphenol*, with allusion to *Diosma*, the original Linnean name bestowed on the buchu plants. The upper, lighter layer (B), on being extracted repeatedly with warm water, further affords a small amount of diosphenol. The crude oil, as obtained from *Barosma betulina*, yielded nearly one-fifth of its weight of the phenol.

A mixture of one volume of alcohol, 0.83 sp. gr., and five volumes of ether is a good solvent for recrystallizing the diosphenol; by gently warming the crude crystals with three times their weight of the mixture, they dissolve, and on cooling afford pure crystals.

The results of two elementary analyses of them were as follows:—

- I. 0.2236 gram of diosphenol gave CO_2 : 0.5752 gram =
0.1569 C and O H_2 : 0.1910 gram = 0.0212 H.
II. 0.2236 gram of diosphenol gave CO_2 : 0.5758 gram =
0.1570 C and O H_2 : 0.1946 gram = 0.0216 H.

From these figures, the formula $\text{C}_{11}\text{H}_{22}\text{O}_3$ may be calculated, viz.:—

		Found.	
		I.	II.
C_{11}	168 70.58 . .	70.17 per cent.	70.21 per cent.
H_{22}	22 9.24 . .	9.48 „	9.69 „
O_3	48 20.18 . .	—	—
	<hr/> 238 100.00		

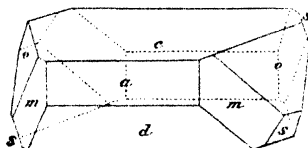
Diosphenol usually forms acicular crystals; by slow crystallization somewhat larger, well defined crystals were obtained, which were crystallographically examined in Professor Groth's laboratory by Dr. A. Cathrein. They will be fully described in Professor Groth's *Zeitschrift für Krystallographie*; in the meantime I am indebted to Dr. Cathrein for summarizing his observations as follows: Diosphenol belongs to the monosymmetrical (*monoclinic*) system. Ratio of axes:—

$$a : b : c = 1.3017 : 1 : 1.5435$$

$$\beta = 81^\circ 7'.$$

Colourless prisms, elongated parallel to the axis b , generally tabulated parallel to c (see fig.). Faces observed :—

$c = (001)$, $d = (101)$, $a = (100)$, $o = (121)$, $m = (110)$, $s = (121)$.



$a : c$	$= (100) (001)$	$81^\circ 7'$
$c : d$	$= (001) (101)$	$55^\circ 7'$
$m : a$	$= (110) (100)$	$52^\circ 8'$
$m : c$	$= (110) (001)$	$84^\circ 33\frac{1}{2}'$
$o : c$	$= (121) (001)$	$70^\circ 6'$
$s : c$	$= (121) (001)$	$75^\circ 58'$

Cleavage distinct, parallel to a (100).

The optical axes for red light in the plane of symmetry, for yellow the substance is uniaxial, for green the plane of the axes is normal to the plane of symmetry. Double refraction negative.

The crystals of diosphenol melt at 83° (181.4° F.) and boil at 233° (451.4° F.); I have, however, not been able to distil it in the usual way without a partial decomposition. By subliming diosphenol in the temperature of a steam-bath, thin prisms two inches long are easily to be obtained. It is readily soluble in alcohol, 0.83 sp. gr., less so in ether, but very sparingly in water. The aqueous solution in boiling water on cooling affords small acicular crystals. The solutions are perfectly neutral, and on addition of an alcoholic solution of ferric chloride assume a dark coloration of dingy green. The crude oil, as well as the water distilled from buchu leaves, exhibit the same behaviour. Diosphenol has a slightly aromatic odour and taste, "*sui generis*," by no means reminding of buchu leaves. It is soluble in concentrated sulphuric acid, but without forming a crystallizable compound; on saturating the brown solution thus obtained with carbonate of barium and duly concentrating the filtrate, I obtained only a small quantity of an uncrystallizable barium salt.

By caustic lye, diosphenol is also readily dissolved, but is not able to decompose the carbonates; by carbonic acid, on the other hand, it is precipitated from its solution in potash, soda, or hydroxide of barium. In 50 parts of the latter ($\text{Ba}(\text{OH})_2 + 8\text{O H}_2$ in 20 parts water) diosphenol dissolves very slowly. By allowing such a solution to evaporate slowly over lumps of potash, no well-

defined barium compound of diosphenol could be obtained, crystals of the pure phenol even gradually making their appearance on the sides of the beaker. Nor have I succeeded in preparing a solid potassium or sodium compound.

These few experiments show that the substance under notice belongs to the class of phenols, although its action on sulphuric acid and the hydroxides of potassium, sodium, and barium, is less manifest than with many other substances of the phenol class.

As to the other constituents of buchu oil, the portion which had been exhausted with caustic lye was again shaken with the same, when it was entirely dissolved, but immediately separated on addition of much water. This oil, washed with water and dehydrated with powdered chloride of calcium, was distilled. Very little passed until 205° C. (401° F.) was reached. The main portion came over between 205° and 210° C., a small amount only was collected above the latter boiling point. All the various fractions of the oil assumed likewise a green coloration when mixed with aqueous or alcoholic perchloride of iron.

The oil boiling between 205° and 210° C. is remarkable on account of its odour, which agrees very nearly with that of peppermint; I know in fact of no other essential oil possessed of this aroma except peppermint. The oil under examination is devoid of rotatory power; submitted to elementary analysis, 0.1942 gram of it gave CO_2 : 0.5528 gram = 0.1508 C and OH_2 : 0.2064 gram = 0.0229 H, that is to say, C : 77.65 per cent., and H : 11.79 per cent. The formula $\text{C}_{10}\text{H}_{18}\text{O}$ requires 77.92 C and 11.69 per cent. H. The main portion of the buchu oil, after the extraction of the phenol, is thus shown to consist of one of the numerous modifications of the molecule $\text{C}_{10}\text{H}_{18}\text{O}$, the presence of which is more and more frequently ascertained among the constituents, both solid and liquid, of essential oils. From some experiments with the crude oil of buchu instituted by Dr. Power, it would appear the compound $\text{C}_{10}\text{H}_{18}\text{O}$ is contained in the oil in the form of a compound ether.

In concluding, I may say that I have not found in the buchu oil salicylic acid, which has been announced by Wayne (*American Journal of Pharmacy*, 1876, 19; also *Year-Book of Pharmacy* 1876, 229), to be yielded by the oil. It remains, however, to be examined whether this holds good for other varieties of buchu leaves than that examined by myself.

The PRESIDENT said the thanks of the Conference were due to Professor Flückiger for his able paper on a rather abstruse subject.

Professor ATTFIELD said the interest of this subject lay in the fact that this substance, diosphenol, was very much like carbolic acid; though the author did not seem to have succeeded in uniting it with alkalies. But he noticed that Professor Flückiger had used solutions of alkalies, and it was not very easy to get perfectly definite compounds which would stand evaporation by putting carbolic acid, that is, phenol itself into alkaline solutions; but if carbolic acid were mixed with the solid alkali combination was effected. It was quite possible that if this diosphenol were mixed with its equivalent proportion of solid alkali a compound would be produced. Perhaps Dr. Power could say whether or not the colour produced by perchloride of iron in the oil from which diosphenol had been separated, was probably due to traces of diosphenol that had escaped separation.

Dr. POWER said the colour depended entirely on the phenol. It did not give the colouring action with chloride of lime. There no doubt would be a little of the crystalline principle remaining in the oil after the distillations.

The next paper read was entitled—

NOTES ON THE CONSTITUENTS OF PEPPERMINT OIL.

By PROFESSOR FLÜCKIGER AND DR. F. B. POWER.

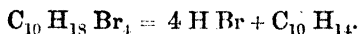
The oil of peppermint is one of the few essential oils which are produced on a very large scale. According to the statistics contained in "Pharmacographia," oil of turpentine, oil of lemon and bergamot, grass oil, and oil of caraway, would appear to be the only ones which are sent to the market in much more considerable quantities than peppermint oil. Oil of cassia in this respect approaches apparently more nearly to the last named.

Peppermint oil owes its value to the solid compound termed menthol, $C_{10}H_{19}OH$. This substance, the alcoholic nature of which was first demonstrated by Oppenheim* by the formation of several compound ethers, has been shown by Beckett and Alder Wright† to be connected both with the paraffin series and the benzene series, inasmuch as by the action of dehydrating agents it is easily converted into menthene, $C_{10}H_{18}$, which, by the action of

* *Comptes Rendus*, liii., 329; *Jahresbericht der Chemie*, 1861, p. 683.

† "Year-Book of Pharmacy," 1875, p. 605.

bromine, combines to form tetrabromdecane, and the latter compound, by heating, being readily split into hydrobromic acid and cymene; or, as expressed by the equation—



The hydrocarbon menthene therefore occupies an intermediate position between the decane of the paraffin series, $\text{C}_{10}\text{H}_{22}$, and the cymene of the "aromatic" series, $\text{C}_{10}\text{H}_{14}$.

With the exception of menthol, no other constituent of peppermint oil has as yet been duly isolated; it seemed to us therefore of considerable interest to determine the chemical nature of the liquid constituents of the oil.

In the beginning we had the intention to submit the Japanese oil to examination, having been obligingly supplied with the fresh herb, as imported into London, by Mr. Thomas Christy, F.L.S., and on the other hand with peppermint oil, imported by Mr. Chantre, F.L.S., of London. The herb, upon being submitted to distillation, yielded immediately an abundance of menthol, accompanied by a small amount of liquid compounds. The oil, presented to us by Mr. Chantre, on the contrary, refused to crystallize, even when exposed for a month to a temperature of from about -15°C . ($+5^{\circ}\text{F}$.) to -20°C . (-4°F .) Upon submitting the oil to distillation, we found it to be largely adulterated with alcohol, after the removal of which the residual oil afforded a good yield of menthol. This unsatisfactory result prompted us to work on the Mitcham oil.

The oil employed for analysis was obtained from Messrs. Schimmel & Co., of Leipsic, and consisted of Mitcham oil, which they had deprived by repeated rectification as completely as possible of menthol.

According to information furnished us by Dr. Bertram, the superintending chemist of Schimmel's laboratory, the crude Mitcham oil yields 80-85 per cent. of a liquid product, sold by the firm as "extra strong oil," and consisting principally of menthol, together with about 10 per cent. of an oil which has remained as yet uninvestigated; the loss of 5-10 per cent. resulting from the separation of the constituents consisting of soft resinous matters. The oil from which the menthol had been separated was submitted by us to fractional distillation. The largest portion was found to distil at $165-175^{\circ}\text{C}$., a smaller fraction of somewhat viscid character being collected at $250-275^{\circ}\text{C}$. The first fraction, or that collected at $165-175^{\circ}\text{C}$., was then submitted to elementary analysis with the following result:—

0.1690 gram of substance gave 0.5348 gr. $\text{C O}_2 =$
 0.1458 C, and 0.1868 gr. $\text{H}_2\text{O} = 0.207$ H.

Calculated.				Found.			
		$\text{C}_{10}\text{H}_{16}$		$\text{C}_{10}\text{H}_{16}$			
C_{10}	120	88.23		C	87.00		C 86.27
H_{16}	16	11.77		H	13.00		H 12.25
	136	100.00			100.00		98.52

This result would serve to prove that the body consisted essentially of a hydrocarbon, contaminated with a small amount of oxygenated substances. It was then purified by repeated distillation over metallic sodium, and was so divided into two fractions, boiling respectively at $165\text{--}170^\circ\text{C.}$, and $173\text{--}176^\circ\text{C.}$; at the same time the peppermint odour of the original liquid having disappeared and given place to that of freshly distilled oil of turpentine. The two fractions were then separately submitted to analysis, with the following result:—

1. Fraction $165\text{--}170^\circ\text{C.}$

9.2428 gram of substance gave 0.7844 gr. $\text{C O}_2 =$
 0.2139 C, and 0.2624 gr. $\text{H}_2\text{O} = 0.0291$ H.

Calculated for $\text{C}_{10}\text{H}_{16}$				Found.			
C_{10}	120	88.23				C	88.09
H_{16}	16	11.77				H	11.98
	136	100.00					100.07

The specific gravity of the liquid is 0.859 at 20°C. ; its rotation in sodium light in a tube of 100 mm. at 25°C. , is 13° to the left.

2. Fraction $173\text{--}176^\circ\text{C.}$

0.1871 gram of substance gave 0.6032 gr. $\text{C O}_2 =$
 0.1645 C, and 0.2004 gr. $\text{H}_2\text{O} = 0.0223$ H.

Calculated for $\text{C}_{10}\text{H}_{16}$				Found.			
C_{10}	120	88.23				C	87.87
H_{16}	16	11.77				H	12.08
	136	100.00					99.95

The specific gravity of the liquid is 0.856 at 20°C. ; its rotation in sodium light in a tube of 100 mm. at 25°C. , is $24^\circ 4'$ to the left.

The two fractions, when treated with the nitric acid mixture, afforded after standing for some time no crystals of terpene, and upon saturation with dry hydrochloric acid gas, only liquid hydrochloric compounds were formed.

3. The small fraction collected at 250–275° C., afforded after repeated rectification over metallic sodium a colourless, limpid liquid, boiling at 255–260° C. It was analysed with the following results :—

0.1962 gram of substance gave 0.6312 gr. CO_2 =					
0.1721 C., and 0.2132 gr. H_2O = 0.0237.					
Calculated for $\text{C}_{10}\text{H}_{16}$.					Found.
C_{10}	120	88.23	.	.	C 87.87
H_{16}	16	11.77	.	.	H 12.08
	136	100.00			99.95

The molecular formula of this fraction in view of its high boiling point is undoubtedly a multiple of the simple formula $\text{C}_{10}\text{H}_{16}$, and would be more correctly expressed by the formula $\text{C}_{15}\text{H}_{24}$, in accordance with the molecular formula of those terpenes having similar boiling points. Its specific gravity is 0.912 at 21° C.; its rotation in sodium light, in a tube of 100 mm., at 25° C., is 9° 2' to the right.

The liquid portion of Mitcham peppermint oil is thus seen to consist simply of isomeric and polymeric terpenes, containing no menthene, as might be supposed from the dehydration of the menthol, and the absence of compound ethers in the oil is also herewith established.

According to Beckett and Wright,* the liquid portion of *Japanese* peppermint oil contains a small amount of a substance isomeric with borneol, an inference drawn from analytical numbers obtained from a fraction boiling at 210–215°, and which by treatment with zinc chloride yielded principally menthene.

That no body of the formula $\text{C}_{10}\text{H}_{16}\text{O}$ is present in the liquid portion of Mitcham peppermint oil is conclusively established by the analysis of the oil itself, previously freed as completely as possible from menthol, and before treatment with metallic sodium. As has been pointed out in "Pharmacographia," some specimens of peppermint oil are capable of yielding a small amount of a crystalline compound with alkaline bisulphites. This observation we have now confirmed with the crude Mitcham oil; the body in question appearing, however, to be principally contained in the so-called "extra strong oil," and has, therefore, probably a boiling point approximating closely to that of menthol. It is furthermore contained in the oil in such exceedingly small amounts that its isolation for the present must remain unaffected.

* *Journ. of the Chem. Soc.*, 1876, p. 3.

It would also seem possible that to this body the remarkable colour reaction and fluorescence is due, which is displayed by fresh peppermint oil, when allowed to remain a short time in contact with a few drops of nitric acid, sp. gr. 1.20, as the reaction is not displayed by the terpenes, nor by the menthol.* Peppermint oil by age gradually loses the faculty of assuming this coloration with nitric acid, which would also point to a substance easily undergoing chemical change. We have had as yet no opportunity of submitting the terpenes of peppermint oil to oxidation, which should form a subject for a special study, although it is probable that the lower boiling fractions would furnish the same products as turpentine oil, and terpenes having similar boiling points, viz.: acetic, terebinic, terpenylic, and terephthalic acids; while menthol, according to the observations of Oppenheim,† is converted by oxydizing agents chiefly into what he calls "resinous bodies."

The PRESIDENT said the Conference was much indebted to the authors for this paper, which had a considerable bearing on the question of the adulteration of these oils.

Dr. POWER regretted that he was not able to present specimens of these products. It was a remarkable fact that the liquid portion of peppermint oil when entirely free from menthol had an odour entirely distinct from peppermint, but somewhat reminding one of lemon oil, though corresponding more nearly to that of freshly distilled turpentine oil.

Professor ATTFIELD remarked that one paragraph in the paper illustrated very well the risks run by experimenters who depended upon certain commercial articles. The presence of the alcohol in one of the samples examined showed that when essential oils were to be investigated, for purposes of original research, they should be either carefully isolated by the experimenter himself, or obtained from a manufacturer who would guarantee their purity.

Mr. MASON said he believed the specimen referred to was manufactured on the continent. It was quite unusual for oil of peppermint to be adulterated with alcohol in this country.

Mr. GREENISH thought the results showed that adulteration varied over a large number of specimens, and it was difficult to determine what could be relied upon unless the experimenter were present, and saw the oil made, or made it himself. It seemed as difficult to

* See "Pharmacographia."

† *Comptes Rendus*, lvii., p. 360

obtain pure peppermint oil as genuine port wine, which, it was said, could only be secured by going to Portugal and buying a cask, and sitting on it all the way home. In many of these experiments the results could not be relied upon simply because the article was not genuine.

Dr. SYMES thought some of the results obtained would be due to the presence of a resinous matter, and this would vary with the age of the oil. Probably some of the resinous matter would be produced in the distillation, and there would be some oxidation which would also vary in different samples. He should like to know if the experiments had been conducted with oil of a known age or with specimens of different ages, and whether the amount of resin was found to be constant in different samples.

Mr. UMNEY said the Mitcham oil of peppermint would always contain a large amount of this resinous principle, and its presence was owing to the crude way in which the essential oil is manufactured. If any one visited the fields at Mitcham, Carshalton, or the neighbourhood, he would see the herb cut with a sickle and thrown bodily into a still, not heated by steam but by direct fire, and very often some portions get actually charred; thus the empyreumatic matter was driven over, and a large quantity of resinous matter would be present in the oil. He considered that no specimen of English manufacture could be considered pure unless it had been rectified the second time with water, and then a very small quantity of resinous principle would be present.

Mr. REYNOLDS said it was quite necessary to go beyond the mere fact that an article was called "best," because unless there was something added to the superlative, the mere market name carried no guarantee of purity. He had just lit upon a quotation from Southey, in which he said that there was an ingenious tradesman who sold gloves, and whose worst gloves were distinctly known as "best." He had, however, four other kinds, which he called "better than best," "better than better than best," "best of all," and "the real best."

Dr. POWER, in reply to Dr. Symes, said the oil used in these analyses was quite fresh, and had been redistilled by Messrs. Schimmel & Co.; and there was very little resinous matter contained in the oil as sent for analysis, though according to the report of their own chemist it usually showed from 5 to 10 per cent. of resinous matter on rectification.

The next paper read was entitled-

THE RESTORATION OF DISCOLOURED SYRUP OF IODIDE OF IRON.

BY THOMAS B. GROVES, F.C.S.

Numberless articles by accredited writers in the *Pharmaceutical Journal* and elsewhere have shown that the preparation of a nearly colourless syrup of iodide of iron is not a difficult matter, and there has been a pretty general concurrence in the belief that the process of the British Pharmacopœia leaves little to be desired. As to its keeping properties, there has been and probably there still is a good deal of difference of opinion; some going so far as to say that it keeps perfectly well, and needs no special precaution for its preservation, whilst others have devised elaborate ways of bottling and storing or chemical treatment intended to enable the pharmacist to dispense a creditable article when called upon by the prescriber. It is doubtless true that when made with pure sugar, a substance by the bye difficult at all times to procure, the syrup, when in reasonable demand, does keep fairly well, so well in fact that well accustomed dispensing establishments fail to see any difficulty in the matter. Such, however, is not the case with those who perhaps are not called upon to dispense the article once in a month, or even less frequently. Then, on searching the cupboard, it is often found that the syrup without *some* treatment is not presentable, and frequently it happens that for want of knowing what to do in the case the syrup is sacrificed and the patient incommoded. With the view of assisting my brother pharmacists when in this dilemma, I venture to offer a few observations. I must, however, confess that instances have to my knowledge occurred where the pharmacist has not been too scrupulous, and ignoring the refinements of pharmacy has not hesitated to supply his customer with a discoloured syrup. I have myself been hauled over the coals for supplying a colourless and comparatively flavourless article, "apparently not so strong as Mr. Dash's"; in fact have suffered for a time, as did George the First's cooks, who supplied his majesty's table with fresh oysters, "not so 'igh in flavious" as those to which his Hanoverian Highness had been accustomed.

The discoloration of syrup of iodide of iron is doubtless due mainly to the presence of free iodine; when turbidity is present there is probably also a basic persalt of iron in suspension, which adds to the effect. To get rid of both of these it is only necessary to dilute the syrup with say a third of its volume of water, to boil

briskly for a few minutes, then filter through paper, and finally reduce by evaporation to its original bulk. The syrup will then have resumed its original appearance.

The strength of the preparation will not have been materially altered by this treatment, for it takes a wonderfully small quantity of iodine in the free state to colour a large amount of liquid. Thus it will be found that one drop of liquor ferri perchloridi added to half a fluid ounce of freshly prepared syrup of iodide of iron will produce in it the tint of golden sherry, to be completely dissipated by a few minutes' boiling. There is, I am aware, nothing new in this treatment by boiling, etc.; it has, I know, been mentioned already by some writer whose name I have unhappily forgotten, but whose useful though often unused suggestion has not escaped me.

I will now refer to some experiments I have recently made in the same direction, and having for their object the avoidance of the delay attendant on the process already mentioned.

The text-books tell us that when a persalt of iron is brought in contact with a soluble iodide, the salt is reduced to the proto condition, and free iodine is eliminated. It was at one time thought that under these circumstances a per-iodide was formed, but Mr. Squire, junr., some years since proved conclusively that such was not the case by showing that the colour could be removed from such a liquid by simply shaking it with an ordinary solvent for iodine, such as benzine or chloroform. If to such a liquid containing iodine in solution, caustic potash or soda be added, precipitation of ferric oxide will result, and the iodine will combine with the base of the precipitant. Applied to a discoloured syrup of iodide of iron the process does not answer, and that in consequence of the sugar, as it appears to me, exercising a solvent action on the precipitated oxides. In fact it is after filtration more discoloured than ever.

In a paper published in the ninth volume, second series, of the *Pharmaceutical Journal* ("Preservation of Syrup of Iodide of Iron"), I pointed out the effect produced by the presence in the syrup of a trace of phosphoric acid, how that by seizing at the moment of its formation the peroxide of iron and rendering it insoluble, it effectually prevented the reaction ending in the elimination of free iodide that would otherwise have resulted. Syrup, even dilute, will keep for years after being so treated, but of course one gets instead of the discoloration the slight turbidity occasioned by the deposit of perphosphate of iron; this however, being colourless and easy of removal by deposit or filtration, is of but little moment. Addition of phosphoric acid to syrup already discoloured

is of no avail; the mischief has been done and no persalt remains for it to act upon. If, however, previous to the addition of the acid, a few drops of liquor potassæ be stirred into the syrup, the colour disappears almost immediately, and, the acid being in slight excess, will not again return.

Thus I found by experiment that when to half a fluid ounce of syrup discoloured by one drop of liquor ferri perchloridi, I added enough of liquor potassæ (the amount would vary according to the acidity of the syrup) to produce a distinct greenish coloration, the further addition of two drops of dilute phosphoric acid restored the syrup to its original tint.

The use of hyposulphite for this purpose is of course well known, but its employment is in my opinion not so recommendable as that I have just described.

The paper will, I fear, be regarded as simply hateful and utterly unorthodox by the few; but the many will, I hope, not be displeased to learn how of two evils to choose the less.

The PRESIDENT said the thanks of the Conference were due to Mr. Groves for this paper, which was interesting pharmaceutically to them all. There were two very important points in it,—one the decoloration of the colored syrup, and the other the question of the purity of sugar. The latter had no doubt presented itself to all pharmacists who had endeavoured to obtain pure sugar.

Mr. UMNEY said that from 70 to 80 per cent. of the sugar of commerce at the present day was beet sucrose, and such would not do for the manufacture of syrup of iodide of iron, so far as his experience went. He had seen a syrup made from this sugar, even when it had been brought most accurately to the proper specific gravity, become after a time perfectly solid. He had compared it with syrup made in exactly the same way from English refined cane sucrose, and the same result did not take place. He had not had an opportunity of investigating whether this was due to the presence of inverted sugar in the beet sucrose, but perhaps some one could throw some light upon the question.

Mr. HUGHES said he used Martineau's sugar in making all his syrups.

Mr. ANDREWS could quite corroborate what Mr. Umney said. He had had a great deal of trouble with various syrups, and particularly with syrup of the phosphates and Easton's syrup, from discoloration. He had, in fact, commenced a series of experiments on the subject, intending to communicate the results to that meeting,

but pressure of other business, public and private, had prevented his completing the investigation. He felt sure, however, that such a paper would be most valuable. He had adopted the plan of procuring his sugar from one of the large lozenge houses in London, for he could not get it pure from the neighbouring grocers, and by getting better sugar his results were much more favourable.

Mr. NAYLOR said he had noticed latterly amongst the sugar which had come into the market, especially American sugar, that it contained an appreciable quantity of sulphur; and when a syrup had been made containing acid salts, such as hypophosphites or phosphorous acid, where the phosphorous acid was somewhat in excess, after a time the syrup had become turbid and had given off sulphuretted hydrogen. He had not estimated the quantity, but it was quite sufficient to be detected by the smell, and of course it could be readily detected by the ordinary tests, such as acetate of lead. There appeared to him to be very considerable difficulty in obtaining pure cane sugar. There was a difficulty in getting any quantity of Martineau's sugar, according to his experience, but he should like to know the opinion of those who were in the habit of buying large quantities. With reference to the manufacture of iodide of iron, he was scarcely prepared to say that he was dissatisfied with the Pharmacopœia process, but at the same time he believed that manufacturers did not adhere strictly to the directions given. One defect in the process was that the mixture was ordered to be boiled to effect the combination of the iodide and iron. According to his experience there was no such necessity. Again, if the solution were filtered, and the filtrate washed with cold water, a basic iron salt would be thrown down, and it would be quite impossible to keep that liquor so that it would retain its colour. In fact it would begin to show signs of decomposition in half an hour. But if the iodide of iron had not been boiled, and if there were an excess of iron, which appeared to influence it to some extent, the liquor could be kept for some few hours. If no wash water were used, it would not throw down a basic compound of iron. Of course it would not keep for an indefinite time; but for a reasonable time it would show no change.

Dr. SYMES said the subject of keeping syrup of iodide of iron had been a matter of discussion in the *Pharmaceutical Journal* and other papers connected with chemistry and pharmacy almost as long as he could remember. Mr. Groves mentioned a druggist searching his cupboard for this preparation and finding it discoloured; but he should say the cupboard was about the last place

in which to keep it. If it were filled into small bottles, and these put in a strong light, it would keep much better. He had met with samples which had readily become decolorized by being treated in the way mentioned, but on the other hand he had met with specimens which entirely resisted such efforts. It remained even yet a problem what caused the discoloration. He scarcely thought it was free iodine, but believed it was a case of oxidation. The subject, however, of most interest, was probably that of the sugar, which some few years ago he had dealt with, though not perhaps so fully as it deserved, and he was not then so thoroughly aware as he was now of one common impurity in sugar. If he remembered rightly, he then pointed out that if beet sugar were properly treated it could be made almost as pure as cane sugar. For instance, Say's sugar was regarded by some the best to use, and that was entirely from beet; it was the best refined French sugar. The American granulated sugar which he then mentioned he had since used, and found it to be probably the purest; and it was reliable as being cane sugar, and certainly had not to undergo the same treatment as beet sugar had. The fact was, crude cane sugar required much less manipulation than beet sugar to arrive at a state of purity, and consequently there would appear to be more stability about it. The greatest difficulty in the present day, was not the small quantity of glucose which might exist, so much as the presence of sulphur, which arose from the use of ultramarine to make yellowish sugars more white. If a moist crystal of citric acid were wrapped up in a sheet of blue writing paper, and held in a warm hand, it would smell of sulphuretted hydrogen. He had observed this when using such paper to wrap up chemicals, and Mr. Tanner had also noticed it quite independently. Precisely the same thing occurred in a great deal of refined sugar, which was rendered white by the use of ultramarine. He happened unfortunately to have a cask of German granulated sugar, made to look like the American, because that had obtained a reputation as a pure article, and if he made a syrup from it, there would be a decidedly blue scum on the surface. He thought pharmacists should insist on having pure sugar, and if there were a sufficient protest made against this kind of adulteration some good might be done. He did not see why public analysts should not take it up with far greater benefit than many of the matters which they now turned their attention to, and it would go far to remedy the evil they were especially considering.

Mr. ELLINOR said that some years ago he made some syrup of iodide of iron with sugar obtained from a grocer which turned colour,

and almost solidified, and neither boiling nor anything else could restore the colour. He asked the grocer what kind of sugar it was, and was told it was the best French sugar. He therefore concluded that it was some adulteration which caused the change of colour.

Professor ATTFIELD suggested that Mr. Andrews or some one else might follow up the subject he had alluded to, and make experiments on the solubility of cane sugar as distinguished from beet sugar. He had an impression that these two sugars, even when absolutely pure, did differ somewhat, though a chemist, *qui a chemist*, might not be able to say how. Possibly if some physical experiments were made, it would be found that they were only isomeric with each other, not identical.

Mr. ANDREWS, who was understood to consent, said he knew it was a fact that they differed in solubility.

Professor ATTFIELD said Mr. Groves raised the question why syrup of iodide of iron was not discoloured when a little potash or soda was added, and had suggested that it might have something to do with the ferric compound being kept in solution by the sugar. The salt which would ordinarily be precipitated by an alkali no doubt would be kept in solution by the sugar. The fact was there probably was a persalt of iron present; though what that persalt might be he did not know. It might be ferric saccharate; but there was possibly a persalt of iron which, on the addition of alkali, and not until then, was reduced to a ferrous salt with the liberation of iodine, just as perchloride or persulphate would be; and so long as that were so a few drops of solution of alkali would not suffice for removal of free iodine. But the author's method was a better and shorter mode of dealing with the difficulty.

Mr. CLARK asked if Professor Attfield had ever tried the large crystals of sugar such as were introduced by Finzel, of Bristol; because he believed that all English refiners now used beet sugar, but these large crystals could not be made except from cane sugar. This sugar had only been boiled down once from the sugar cane, and it gave these large crystals. He feared that they would see no more of the granulated American sugar which Dr. Symes had referred to, as the process had been patented in England, so that it could not now be imported.

Dr. SYMES said thousands of tons of the large crystal sugar were made in Liverpool containing beet sugar. There was danger of a slight impurity there in the form of lime, because he believed it was made by a patent process by which the sugar was converted into sucrate of lime.

Mr. SAVAGE, referring to Dr. Symes's remark that the syrup retained its colour if exposed to a strong light, wished to ask if it would not deteriorate by continued exposure.

Mr. FLETCHER said an interesting paper on this subject, written, he believed, by Mr. Creuse, had appeared some time since in the *American Journal of Pharmacy*. The author pointed out that in discoloured syrup of iodide of iron there were always two substances present, viz., grape sugar and hydriodic acid. He observed that the discoloration never went beyond a certain point, namely, that which had been called golden-sherry colour, and there it remained. It was also proved by a number of interesting experiments, that if for one-third of the cane sugar, grape sugar were substituted, this discoloration never took place. These results were strikingly confirmed by Mr. Groves's experiments, because it was very clear that on boiling a somewhat diluted syrup, the hydriodic acid present would convert a portion of the cane sugar into grape sugar, and then the discoloration stopped. It was possible also that a strong light would exert a similar influence.

The Conference then adjourned for luncheon.

On reassembling, the first paper that was read was on—

THE DETECTION OF AMORPHOUS QUININE (CHIN- IODIN) IN THE *FERRI ET QUININÆ CITRAS*, B.P.

By DR. J. E. DE VRIJ.

During my visit to London in May last, one of my pharmaceutical friends asked me if I knew a method to detect the adulteration of this medicine by substituting partly the quinia by the (so-called) amorphous quinine. After some reflection I replied affirmatively, and as my friend told me that he had reason to suspect that this fraud was often put into practice, the publication of my process may perhaps be useful.

The test of the B.P. for this preparation is the following:—

“Fifty grains dissolved in a fluid ounce of water and treated with a slight excess of ammonia give a white precipitate, which, when collected on a filter and dried, weighs 8 grains. The precipitate is almost entirely soluble in pure ether, and when burned leaves but a minute residue.”

As the pure amorphous quinine is easily soluble in ether, it is clear that, notwithstanding the quinia is partly substituted by

amorphous quinine, the medicine will answer the test of the Pharmacopœia. This substitution can, however, easily be detected by transforming the separated quinine into a neutral oxalate. This oxalate after being thoroughly dried on a water-bath is dissolved in chloroform, and the solution, if necessary, filtered. If a few drops of water are put on the top of this solution in a test tube, the oxalate of quinine will take a part of the water, and crystals of oxalate of quinine will appear in the chloroform, whilst the water on the top remains clear and *uncoloured* if the medicine is not sophisticated. If it contains, however, amorphous quinine, the oxalate of *this* base will be taken up from the solution in chloroform, and the water on the top of this solution will be more or less yellow-coloured by the oxalate of amorphous quinine which has been dissolved by the water.

The PRESIDENT said this was a practical and useful test, which must commend itself to notice.

Mr. UMNEY thought the test put forward by Dr. de Vrij seemed simple and elegant, and might prove valuable. There could be no question that amorphous quinine was always to be found in the citrate of iron and quinine to some certain extent, and there could also be no doubt that the alkaloid was converted from the crystallizable into the amorphous state during the process of manufacture, but this only occurred to a small extent, and if pure crystalline sulphate of quinine were used, this change would be very slight. He looked upon this test as one which was very simple, and could be applied by almost any one. It was known how insoluble oxalate of quinine was, and the paper showed that the oxalate of amorphous quinine was soluble in water.

Mr. FLETCHER said he hoped when he saw the title of the paper that the test proposed by Dr. de Vrij would have been a quantitative, instead of, as it appeared, a qualitative one. As Mr. Umney had said, amorphous quinine might be found in any sample of citrate of iron and quinine, and if the Pharmacopœia process were strictly followed, he would undertake to say that at least one-fourth of the quinine would be converted into the amorphous condition, the heat employed in evaporating the solution to a syrupy consistence being quite sufficient to convert a large proportion of the crystallizable quinine into the amorphous state, as he had found by practical experience. In the paper he read at the last meeting of the Conference, he described a process for the estimation of quinine in the citrate of iron and quinine, which was based on the fact that

when the alkaloid was obtained, as in the usual way, by precipitation with ammonia and re-solution in ether, evaporating the ether, and weighing the anhydrous quinine (dried at 120°), one was able to calculate exactly how much sulphuric acid was required to convert that quinine into basic sulphate, and if the requisite number of cubic centimetres of decinormal sulphuric acid were added to this anhydrous quinine, and the vessel in which it was contained were kept for a short time at a gentle heat, the whole of the quinine would be converted into basic sulphate, which crystallized out on cooling. Further experience, however, had convinced him that it was not advisable to dry the quinine at 120° , because at that temperature a very considerable portion of it was converted into amorphous quinine. He had made a number of experiments to verify this, by taking pure sulphate of quinine—not that of commerce—but that which had been freed from cinchonidine by five recrystallizations. Taking a weighed quantity of this sulphate, precipitating by ammonia, extracting by ether, and drying at 120° , and re-converting that into sulphate by the addition of the requisite number of cubic centimetres of decinormal sulphuric acid, there was a loss of from 5 to 10 per cent. on the theoretical quantity. Not only that, but if the filtered solution from the first crystallization of the sulphate were examined, it would be found that a large quantity of the quinine which was missing as crystallizable sulphate was present in the solution as amorphous quinine, as could be easily proved by precipitating with ammonia, redissolving in ether, and drying that at 120° , when the precipitate, instead of being white, as in the first instance, would be quite yellow, and it would have precisely the taste of amorphous quinine. He thought Dr. de Vrij's process would very possibly condemn as sophisticated citrate of iron and quinine which had been prepared according to the British Pharmacopœia process, and the more strictly that process was followed, the more amorphous quinine would be produced. There was a very simple test, which every pharmacist could use for himself with a very little practice, and which would detect 5 per cent. of amorphous quinine. It was simply necessary to take a scale and place it on the tongue, the difference in taste between that and the genuine preparation would be so distinct that no one could possibly mistake it. The bitter was as distinct as was the bitter of aloes from that of quassia. From experiments he had made, he had conclusively proved that there was no better test for the presence of amorphous quinine than this.

Professor ATTFIELD suggested that possibly Dr. de Vrij's process

might be made quantitative by treatment of the aqueous solution, evaporation, and so on.

Dr. SENIER said it seemed to him that although in the hands of experienced chemists this process might be useful, in the hands of ordinary pharmacists, or those who had not had special training in the crystallization of these salts, it would be found difficult. One portion of the process involved the formation of neutral oxalate from a certain amount of possibly mixed alkaloid, but that amount was not mentioned. It would be necessary to use several grams at least, of citrate of iron and quinine, and then it would not be found easy to neutralize the alkaloid, so as to secure practically complete crystallization. He should like to ask Mr. Fletcher a question in respect to the crystallization of neutral sulphate of quinine from the residue of mixed alkaloid obtained from commercial citrate of iron and quinine. In his paper of last year, Mr. Fletcher recommended that to convert this residue into neutral sulphate it was only necessary to treat it with an amount of decinormal sulphuric acid, measured from a burette, which would correspond to the weight of alkaloid were it all quinine. Had Mr. Fletcher found no difficulty in carrying out this method? He (Dr. Senier) had found that much care was necessary in order to convert quinine into neutral sulphate. Indeed, he should have said, on the face of it, that any measurement of a decinormal solution of sulphuric acid from a burette would not have been accurate enough. He would suggest also whether the amorphous quinine derived from white crystallized sulphate of quinine would necessarily be coloured.

Mr. FLETCHER said he recommended in this test 20 grams of sulphate to be used for the examination. From that amount there was a very fair proportion of quinia obtained, and if the decinormal solution of sulphuric acid was made carefully, and tested gravimetrically, there could not possibly be any more accurate method. Certainly it was much more accurate than deciding whether one had enough sulphuric acid to convert the alkaloid into basic sulphate by testing with litmus. As far as his own experience went, the quantity of sulphuric acid theoretically indicated had been found absolutely correct. The whole of the alkaloid went into solution, a perfectly transparent solution was obtained, which was alkaline to litmus, and from this solution the basic sulphate crystallized out in splendid crystals. With regard to the second question, he certainly should expect that the amorphous alkaloid would be slightly coloured, because he believed that it was always so, however pure or however prepared. He thought the colour

combined with taste was as good an indication of the presence of amorphous quinine as could be obtained, provided it had been extracted by ether, and dried at 120° .

Mr. NAYLOR said he had made a great number of quantitative estimations of quinine by Mr. Fletcher's process, and always found it answer admirably, nor had he met with the difficulty of neutralizing the quinine to which Dr. Senier had referred. Altogether the process appeared a very manageable one and exceedingly satisfactory. He preferred it much to the method of dissolving the quinine in sulphuric acid, and ascertaining when the solution was neutral by means of litmus, or by afterwards making it neutral by means of alkali, so as to obtain the basic sulphate. Different samples of citrate of iron and quinine differed very greatly in their acidity, and he should like to ask whether it would not be possible to get scales which were much more neutral than those generally sold in the market. Some makers prepared the citrate far less acid than others, but he did not know whether the presence of amorphous quinine exercised any influence on this.

Mr. FLETCHER said the citrate of iron and quinine which he found most appreciated by pharmacists was that which dissolved readily without any deposit; but such citrate contained much more citrate of ammonia than the Pharmacopœia preparation. A short time ago a wholesale house applied to him for an explanation of a reaction which had been pointed out to them by a chemist in the country, as occurring when dispensing citrate of iron and quinine with iodide of potassium. A large precipitate occurred slightly coloured, which caused the mixture to be returned with the remark that the pharmacist who had previously dispensed it had supplied a mixture perfectly clear and bright. On examining the citrate of iron and quinine which had been supplied, he found it in all respects perfectly pure, but it was rather slow in dissolving, from which he inferred that the citrate of ammonia was somewhat deficient. He tested a sample of Howard's citrate of iron and quinine with iodide of potassium, and found that it gave a precipitate, which was no doubt hydriodate of quinine, and its colour and quantity would be dependent on the one hand on the acidity of the citrate of iron and quinine, and on the other on the alkalinity of the iodide of potassium. As he had said, the citrate which was most appreciated contained an excess of citric acid and citrate of ammonia, and a preparation of that sort he found would not give a precipitate immediately with iodide of potassium.

Mr. GERRARD said Dr. de Vrij's paper pointed out a defect in

citrate of iron and quinine with which few were previously acquainted, and one practical result would perhaps be to try and remedy that defect. One of the best ways of doing so would be to dispense only a solution of citrate of iron and quinine which had not been submitted to the amount of heat required to get it into the scale form.

Mr. GREENISH observed that in dispensing iodide of potassium in a mixture of citrate of iron and quinine there was occasionally a separation, but he had always considered it was hydriodate of quinine formed, and did not think it was influenced by the solution, because he had used it both in solution and not in solution.

Mr. GERRARD said it was the drying which produced the amorphous alkaloid.

Mr. HUGHES said he had found some difficulty in dispensing iodide of potassium with quinine, and if any one could suggest a means of overcoming it he should be very grateful.

Mr. FLETCHER said if the citrate of iron and quinine dissolved rather slowly, and did not form an absolutely brilliant solution, one might at once come to the conclusion that it was somewhat deficient in citrate of ammonia, and he should add either a little excess of citric acid or a solution of citrate of ammonia containing an excess of citric acid.

Mr. HOWELL said Dr. Langdon Down frequently ordered citrate of iron and quinine with iodide of potassium, to which he generally added a small quantity of citric acid. When the prescription was in that form it ceased to precipitate.

Mr. GREENISH thought Mr. Fletcher's remark really opened a very grave question, whether a dispenser was justified in adding such a thing as citric acid with a view of obviating a decomposition which must occur in more or less time. He did not think he was.

Dr. SYMES could not endorse that view. He was the last to tamper unduly with a prescription, but as they had heard that day, citrate of iron as found in the market was not a definite chemical substance which could neither be more acid nor more alkaline than originally intended, but in fact was received in all sorts of conditions. One of his earliest difficulties as a dispenser was to dispense a prescription often written by an eminent physician at Leamington, containing a small quantity of sal volatile with citrate of iron and quinine. They found that with the article of one manufacturer, when manipulated properly, dissolving it first in a large bulk of water and using an acid citrate of iron and quinine, the mixture could be kept from depositing to any extent. In the case

of iodide of potassium he had an idea that it was a slight alkalinity of the iodide and a very neutral condition of the citrate of iron and quinine which brought about the precipitation. If it were known as a fact that one manufacturer would supply citrate of iron and quinine slightly acid, whilst another supplied it neutral, he saw no difficulty in adding a minute percentage of citric acid, which should really exist in the substance. It was useless discussing matters of difficulty if they could not escape them, but it seemed to him if they could see a means of remedying an evil without bringing about any unsatisfactory results they should adopt it.

Mr. MORRIS said if this fact were better known, medical men would be able to introduce a little citric acid in such cases without the pharmacist undertaking it on his own responsibility.

Mr. UMNEY said the truth might sometimes be known with advantage. Nine years ago in the *Pharmaceutical Journal* he pointed out that if citrate of iron and quinine were made by the form given in the Pharmacopœia the resulting sealed salt invariably, when dissolved by water, was turbid. He had for about ten years used about $2\frac{1}{2}$ per cent. more of citric acid, and in this way produced a preparation that would form a proper solution without a trace of turbidity, at the same time it was exceedingly soluble.

Mr. GROSE asked if citrate of iron and quinine when dispensed with iodide of potassium would liberate the iodine. He sometimes had a peculiar prescription to make up containing citrate of iron and quinine and iodide of potassium, and he got a nasty looking mixture, which was not at all right. The question was, was he, as a retail pharmacist, justified in supplying the defects of the manufacturer. Take the case of iodide of potassium and spirit of nitrous ether; if they got a decomposition, were they justified in neutralizing the free acid in the spirit of nitrous ether?

Mr. SAVAGE thought the lesson to be deduced from this discussion was a practical one, not that chemists themselves in retailing should vary a prescription in any way, but that manufacturers like Mr. Umney should learn the lesson, and send the preparation out to them in such a form that they could use it.

Mr. GROSE said the question was if the manufacturers did not do so, what must the chemists do? Now-a-days there was a good deal of competition, and people sent out a good-looking salt which would take with the customers, and were not always very particular if it did not turn out quite as it should do according to the Pharmacopœia.

The PRESIDENT said he could assure Mr. Grose that manufac-

turing chemists had a great deal to think about in this way, as well as retail ones. They must try and get on as well as they could together.

Mr. GROSE said he had found in the case of the ammonia-citrate of iron, that sometimes it was very acid. He frequently had prescriptions of ammonio-citrate of iron and bicarbonate of potash or soda, and unless he was very careful, bang went the bottle. It was not at all satisfactory, if they sent out a mixture in a hurry, for the servant to come in the next day and say the bottle had burst and his suit of clothes had been spoilt.

A vote of thanks was passed to Dr. de Vrij for his paper.

The next paper read was entitled—

NEW AND UNOFFICIAL PHARMACEUTICAL PREPARATIONS.

By CHARLES SYMES, PH.D.

On the present occasion I do not propose to read a paper giving the result of original investigations or research, but simply and shortly to bring before the members of the Conference a subject which I believe to be of importance to all practical pharmacists, and the discussion of which it is hoped will be both interesting and profitable.

Two years ago, at Dublin, it will be remembered, a discussion arose as to the precise strength of the article that should be used when aq. flor. aurantii was prescribed, and it was found that in the absence of any authority, the usage of dispensing houses differed widely, some regarding that known as the "triple" water, others considering the "diluted" as proper to supply. Unfortunately no satisfactory conclusions were arrived at, and the matter remains to-day where it did then, viz., in an undetermined and unsatisfactory state. If now, such a simple article as this admits of so wide a variation, we shall not be surprised to find that many other less commonplace preparations do so equally, with the obvious result of creating confusion and raising doubts in the minds of physician, pharmacist, and patient—the former often failing to obtain results which from the published experience of other members of the profession he has a right to expect, the second feeling doubts as to whether he is carrying out with precision the wish of the prescriber, and the latter, from differences in appearance, etc., when the pre-

scription is dispensed at different pharmacies, losing confidence in the treatment. Some manufacturers devote special attention to certain classes of preparations, and by producing old compounds possessing marked excellence, or new combinations having distinctive characters, they acquire a reputation for such and have a kind of proprietary right therein. It is not, however, to these I desire to direct attention, but to those in which no one appears to possess such claims as priority in speciality of character and for which no authoritative or recognised formulæ exist. Tincture of gelsemium is an example, which, according to a recent article in the *British Medical Journal*, varies in strength from 1 in 5 to 1 in 10, or 100 per cent., and there appears no evidence to show whether the stronger or the weaker is correct. Tinctures of jaborandi, eucalyptus, boldo, etc., may vary similarly. In the early days of croton chloral hydrate, we prepared a syrup therefrom as follows:—

Croton (or Butyl) Chloral Hydrate	480 grs.
Boiling Distilled Water	6 ozs.
Glycerine	6 „
Syrup of Orange Peel	18 „

One fluid drachm containing two grains of the active ingredient. There was evidence that such a preparation was desired on the part of the medical profession, and doubtless other firms and individuals, equally early with ourselves, possibly before us, prepared somewhat similar compounds, but it is scarcely probable that these all accorded in strength and character. A dozen or more formulæ exist for the syrup known as chemical food (the original formula of Parrish not yielding satisfactory results); hence it varies in colour, density, acidity, and strength.

Medicinal bromohydric or hydrobromic acid is now largely prescribed, and for its preparation several formulæ have been published; one by Dr. Wade, the physician who originated the idea of using it internally as a medicine, which provides for 10 grains of combined bromine in the drachm; another by Dr. Fothergill, yielding a product of about half that strength; and one by Dr. Squibb, of Brooklyn, producing a purer acid, and containing 33·4 per cent. The weaker acid is the one best known and most generally used in this country; but as Dr. Wade points out, it is not that with which the original experiments were made and results obtained which recommended it as a useful therapeutic agent.

Fluid extracts are in the United States so prepared that a fluid ounce shall as nearly as possible represent one ounce of the crude

drug. No rule of this kind exists in Great Britain. Indeed the official fluid extracts vary so much in strength, that we have as it were a licence to prepare the unofficial of any strength we please; therefore when a new drug is introduced, half a dozen manufacturers may prepare fluid extracts from it of as many different strengths: the physician who prescribes and the pharmacist who dispenses it, both being ignorant of the exact relation it bears to the drug. Quebracho, coca, rhamnus frangula, etc., are examples.

Perfect as is the present Pharmacopœia when compared with its predecessor, it nevertheless contains some unsatisfactory formulæ, which are generally known to be so. Now each operator remedies these defects according to his own views or to those of others who, after investigation, publish the conclusions arrived at; thus certain official formulæ became replaced by unofficial of greater or less variation.

My object is not to enumerate instances but to illustrate the fact already stated, that a large number of preparations in general or occasional demand exist for which there are no recognised formulæ or strength, and thus an element of uncertainty is created which should not obtain in the domain of pharmacy.

If the British Medical Council could see its way to a decennial revision of the Pharmacopœia (which at present it does not appear to do), it would scarcely cope fully with the difficulties I have mentioned, although some of them would be remedied more readily than they now are. At present we are abandoned to the winds of uncertainty as to when reform is likely to be brought about, and it behoves us to seek some means by which we may bridge over the difficulty. *Appropos* of this, it has occurred to me as desirable that some standing authority should exist to give semi-official or official sanction to formulæ for tinctures, fluid extracts, etc., as occasion might arise, which would ensure greater uniformity and provide a means by which many remedies could receive a far more satisfactory trial than they now do.

If the discussion resulting from these few remarks indicates that the difficulty is regarded by others as of the same importance that I have assumed it to be, it will remain for the Conference to consider the desirability of adopting some means for constituting such an authority, either from its own members, or partly, so and partly from the Medical Council, if that body could be induced to take up the matter jointly with us.

The PRESIDENT said many of these preparations had given pharmacists great difficulty. The subject was worthy of discussion, what authority could be established by which preparations might be guaranteed when they become of sufficient importance to demand such a position.

Mr. GROSE said he could bear out Dr. Symes's opinion that the number of unofficial preparations caused a great deal of inconvenience, especially to country pharmacists. He sometimes had a thing ordered by medical men who had seen it recommended in the *Lancet*, or some other medical journal, and he knew nothing whatever about it. He could only write to town for it, and perhaps it came too late for the patient. Only the other day a customer of his was very ill, something was ordered which he could not get in the town, and the next morning the man was dead. Of course it was not an official preparation. A little while before that the liquid extract of spigelia was ordered: he sent to his wholesale house for it, but they could not get it anywhere, though they kindly sent him the formula from which to prepare it.

Mr. GREENISH said he had practically found that one great difficulty in connection with these things was that they were introduced in such numbers that their name was legion, and many of them were of so ephemeral a character that half of them, or more, were out of the market almost as soon as they were in, and perhaps sometimes before. If they had any Committee of the Medical Council, or of pharmacists, or any other body of men to attend to this matter, it would have to be a permanent committee constantly taking into consideration the preparations coming before the public, some of which had not apparently any claim to be prescribed. The question of aqua aurantii floris came before the Conference at Dublin, when he expressed the opinion that it being a triple preparation it must occur to any pharmacist that it should be mixed 1 part with 2 of water. With regard to chloral hydrate, it was almost a pity that there were such things as simple solutions introduced into the Pharmacopœia. He could not understand syrup of chloral hydrate being prescribed. Let there be a solution of the chloral hydrate, and let the medical man order so many grains as he thought fit to be mixed in syrup or anything else, as he desired. Why should there be a form which was simple chloral hydrate mixed with syrup and water? This led to the great difficulty that pharmacists had to keep a number of compounds which might just as well be made up at the time they were wanted. He thought it would be well if there were a sort of Appendix to the Pharmacopœia, to which new pre-

parations should be added, and there might be also another part, of perhaps as many pages, forming a sort of limbo, into which the old ones might be put as new ones came in, and thus the Pharmacopœia itself might be kept tolerably clear, and about its present size. With regard to these new preparations, if they were not found in the *Pharmaceutical Journal* itself, they would be usually found in the advertisement part, and if they were all to be put into the Pharmacopœia, it would soon become very much larger than a family Bible.

Mr. MASON thought that Mr. Greenish had overlooked the fact that when chloral hydrate was first introduced several wholesale houses manufactured a syrup of it. When manufacturers made a new thing, they did their best to get medical gentlemen to order it, and the consequence would be that different houses might send out syrups of different composition and different strength. This was one of the cases where the Pharmaceutical Committee would come in and say that syrup of chloral hydrate when supplied should be of a certain strength.

Mr. GREENISH said he did not want a syrup at all; let a medical man, if he wanted 15 grains of chloral hydrate to be given, order it, and the pharmacist might put it into the mixture; the medical man might order syrup if he liked.

Mr. UMNER said in spite of what Mr. Greenish had remarked, there was very great weight in Dr. Symes's statements. He was frequently put on the horns of a dilemma to know what he was to do with a certain class of preparations when orders were put in his hands for the same. He generally searched the Pharmacopœia first, and if he found the preparation there prescribed according to a formula, unless his experience told him that it was dictated wrongly (which did sometimes occur), he so prepared it. If he did not find it there, he searched other pharmacopœias, the *Pharmaceutical Journal*, or the *Year-Book of Pharmacy*. Many of these new preparations were to be found in the American Pharmacopœia; and if that was the case, he thought they ought to be loyal to it and prepare them according to the directions there given. Many too could be found in the Pharmacopée Universelle and L'Officine. Still, there was the difficulty that there were these new preparations, some of which were not to be handled with impunity. For instance, tincture of gelsemium, which he always made 1 in 5, and which some made 1 in 10. Both formulæ had been published, and it was in these matters that the great difficulty arose. If there were some committee, as Dr. Symes suggested, probably there might from time to

time be a certain amount of responsibility taken out of the hands of practical men ; and it would tend to give a certain amount of uniformity to dispensing. The Conference was much indebted to Dr. Symes for bringing the subject forward.

Mr. SAVAGE said this was an important subject, and only showed more than ever the desirability of pharmacists being properly represented when the new Pharmacopœia was compiled. He thought the President and the Vice-President of the Pharmaceutical Society would form a capital committee to refer matters of this kind to.

Professor ATTFIELD said the difficulty to which Dr. Symes had drawn attention existed in the United States as well as in Great Britain, and only on the previous day had formed the subject of a conversation between Professor Maisch and himself. He had long ago arrived at the conclusion that the doctrine of evolution might be trusted to give a good account of a large number of the substances introduced ; there would no doubt be a survival of the fittest, and the others might be disregarded. But the question was, what to do with those preparations which did survive for some considerable time, with a view to insure uniformity of strength. One of the most practicable of the answers to that question involved the consideration of the proper periods for the issue of new editions of Pharmacopœias. In America some desired to have a new Pharmacopœia once every ten years, and probably that idea would be carried out ; but there was a large party who wished to have it every five years, chiefly in order that new preparations which were worthy of it should have an official character given to them. Professor Maisch said that he and several prominent pharmacists in the States were of opinion that a pharmacopœia coming out every five years would cause an endless amount of trouble both to medical men and to pharmacists ; they were of opinion that ten years was quite often enough to have a new pharmacopœia, and they proposed to meet the difficulty now discussed in some such way as this : a committee of gentlemen engaged in the construction of the Pharmacopœia should be appointed, with power to consider the value of newly-introduced preparations, and that those which seemed to have anything like a trustworthy character and to be valuable, should be placed in an appendix, which might be published every two or three years, or certainly every five years, and that then, decennially those preparations of the appendix which seemed to show that they were worthy of being placed in the Pharmacopœia itself should be placed there, and the others omitted altogether. There would thus be something between an official pharmacopœia and an un-official

notice of the preparations in journals : and that would facilitate the introduction of good new remedies into medical practice.

Mr. NAYLOR agreed with Dr. Symes's remarks, but should not have risen except for the fact that he had referred to quebracho. A little time ago none could be obtained in the market, and it was not at all known what was the strength of the preparation then sold. Since that time repeated inquiries had been made with reference to the strength, and he might say that that generally sold was a liquid extract made of such a strength that two parts of the fluid extract should correspond to one part of the bark. He quite agreed with the remarks of Mr. Umney, and had always followed the same plan himself, namely, in a case of this kind to refer to various pharmacopœias, and then to look up the literature on the subject.

Mr. LLOYD thought it would lessen the difficulty if wholesale houses would mention the composition of the article and the strength of the preparation.

Mr. NAYLOR thought wholesale houses were always very ready to give every information desired.

Mr. ANDREWS said this was a very wide subject, and a very important one, and if all were to be said on it that could be said, it would occupy the whole of the afternoon. He rose to make one suggestion : that when medical men ordered a new preparation, they should give some indication of the strength required. He had occasionally found, for instance, that when it was a new medicine for which there was no official formula, they had put 1 + 20, which he understood meant 1 in 20. If medical men would do that it would relieve chemists of a vast amount of responsibility and trouble, and they would know at once what was intended. This was far more common in foreign prescriptions than in English; for in this country some of these new remedies were ordered in a sort of random way, which caused great difficulty to pharmacists. He had now from fifty to one hundred preparations which he had only used once or twice and never heard of afterwards. Of course it could not be expected that medical men should confine themselves to old remedies if new ones were suggested, for it was only by experiment that the useful could be singled out from the worthless.

Mr. SCHACHT said the difference in the strength of medicines was a matter which every one must regret, and to that extent he felt grateful to Dr. Symes for having introduced the subject; but he did not sympathize so much with one of the suggested remedies where reference was made to the possibility of escaping from the

dilemma by something like an authoritative declaration from that Conference. He should regret very much if the Executive regarded it as part of its duty to lay down any rules whatever for the guidance of anybody; he thought rather its aim should be to elicit individual opinion to the fullest extent, but that it belonged to another body, a more distinctly representative body, to declare anything which had the semblance of authority. He, therefore, hoped that discussions on such matters would only take the line of eliciting individual opinion, and to that extent control the exercise of the profession in other hands.

Mr. MORRIS said the great evil was the different strength of preparations, and although the plan adopted by Mr. Umney was very good so far as it went, it frequently happened that there were two or three formulæ given for one preparation; some might adopt one and some another, and by that means they had various preparations to dispense where there should be only one of uniform strength. He saw no other mode of getting over the difficulty than by having somebody whose opinion would be an authority. He thought the plan suggested by Professor Attfield a very practical one.

Dr. SYMES, in reply, said Mr. Greenish had pointed out that there were such a number of these preparations, and their existence was exceedingly short. No doubt they were numerous, but he thought they were not so numerous as they appeared. They were troublesome, and on that account they appeared to be more numerous than they were. When a new preparation was introduced it was a source of some trouble to pharmacists, but it was part of their duty to take it. Shirking or ignoring a difficulty did not get one out of it; and when a new preparation was introduced, the medical profession had a right to claim from pharmacists all the assistance they could give them to get it in the best possible form, and also of a uniform strength. As to the length of life of these new remedies, it was a question, as Professor Attfield had said, of the survival of the fittest; but no pharmacist had the right of ignoring a thing, or by carelessly dealing with it, to strike a nail in the coffin of the new preparation. He had not referred to syrup of chloral hydrate, but to croton chloral hydrate. It was an elegant preparation, and was largely used in Liverpool. The difficulty was, if people went from one part of the country to another, a syrup of quite a different strength might be dispensed. The tincture of gelsemium he always prepared 1 in 10, which showed how the practice varied, and he had known that strength in the doses prescribed by a medical man to produce very marked toxic effects. He could scarcely agree with

Mr. Schacht that it was not the work of the Conference to accept some office of this kind. If they went to the Pharmaceutical Society, it would be almost certain to avoid taking any responsibility of the kind, and would probably hand it back to them to deal with. In Paris, it was true, the Pharmaceutical Society had really accepted the duty he had mentioned, and published a number of unofficial formulæ for the benefit of pharmacists, and he was not sure that something of that kind had not been done in the United States. It should be remembered that many pharmacists had not the opportunity of referring to a number of the works Mr. Umney had spoken of. But in addition to those, he might say that he referred sometimes to the "Homœopathic Pharmacopœia," and it had considerably assisted him sometimes. On one occasion tincture of drosera was ordered by a physician, but it did not occur, he thought, in any of the books mentioned by Mr. Umney. He had no difficulty in finding it in the "Homœopathic Pharmacopœia," and it was prepared 1 in 10, as indeed were all the tinctures, he believed, from dry drugs which were used homœopathically.

The PRESIDENT said, as books had been referred to he might mention two which he had found particularly useful, one was Dorvault's "L'Officine," and the other that of the gentleman who had been with them that morning, Stillé and Maisch's "Dispensatory." The information was there brought up to the latest date, and it was very useful.

A vote of thanks was passed to Dr. Symes.

The next paper read was on—

THE CULTIVATION OF CALISAYA.

By JOHN ELIOT HOWARD, F.R.S., F.L.S.

The death and *post mortem* examination of a small tree of *Calisaya anglica* will furnish a suitable introduction to some comments on the subject of this paper.

I append a photograph of this tree taken in the autumn of 1879; from which it will appear that it was in luxuriant health a few months since. On returning home last month, I noticed a very unfavourable change in its appearance, and detected some white spots on the bark arising from fungus, which I knew from previous experience to be a fatal indication of disease. On further examination I found that canker had invaded the plant to a serious extent;

and after trying in vain some heroic remedies, I determined to root up the calisaya, and if possible gain some useful information as to the cause of its death.

The age of this small tree was eight years. The height between seven and eight feet, but would have been much more had I not been compelled to cut off the top some years back, in accordance with the requirements of my conservatory.

Before doing this, I succeeded in taking a strip along this upper portion, and renewing the bark under moss, as practised in India. The girth of the stem at the base was $9\frac{3}{4}$ inches, and about $6\frac{1}{4}$ inches at the summit (where cut off). The result of the analysis of the bark of my tree was as follows:—

Calisaya Anglica Quill = 1.25 Sulphate of Quinine, 0.70 Cinchonine, 0.15 Quinidine.

Calisaya Anglica Stem Bark = 3.20 Sulphate of Quinine, 1.50 Cinchonine, 0.32 Quinidine.

Calisaya Anglica Root Bark = 3.95 Sulphate of Quinine, 1.00 Cinchonidine, 4.00 Cinchonine, 0.27 Quinidine.

This must be considered satisfactory for a tree grown under glass in England.

I send the lower portion and also the renewed summit for inspection, together with some pressed leaves showing the character of the foliage. These were taken off just before the tree was rooted up; and I may notice, as a feature of the disease, that the petiole separated with a brownish scar, the leaves falling as those of deciduous trees, in the autumn.

As regards the cause of this complaint, which seems generally to supervene after my plants of cinchona have attained a certain age (say, as in this case, about eight years), I was not able to learn anything very definite. I suspect that the oxidation of the cinchotannic acid may take a wrong direction,* and instead of contributing to the formation of alkaloid, may produce the brown discoloured patches which extend upwards from the roots through the midst of the bark; but the source of the mischief seems to be in the roots themselves, the small fibrillæ of which perish. It has been supposed that this arises from a redundancy of moisture; but I have two fine plants of *Calisaya*, one of the *vera* (published as such by Sir Joseph D. Hooker), the other of *Ledgeriana*. These have as yet shown no signs of the malady, though growing in the same bed of earth.

I learn from the report of a recent visitor to the plantations in

* It is important to seal up any accidental wound or amputation, otherwise the sap around is liable to injury.

Java* that they have there “no canker, and few trees die from wet feet, for the land is elaborately terraced before it is planted with cinchona.” “The *Ledgeriana* grows best in the best soils of that country.” The great superiority of the Java soil, possessing as it does such abundant elements of fertility, is particularly noticed. “The weeds, which are very abundant, are cut down three times a year, and left to decompose, forming an additional source of fertility to the plant; whilst in their very growth they are supposed to be useful. They keep the soil together, they catch and retain the rain and dew, they prevent wash, and hinder the rays of the sun from beating down on the bare surface of the soil, and keep it in the condition nature intended it to be in. They are also a safeguard, for if you denude large tracts of country of every kind of vegetation except the one kind you are cultivating, you concentrate on the devoted head of your favourite type of vegetable life all the attacks of all the enemies of vegetation which float in the air or which burrow in the ground.” So much in the defence of the weeds; but it must be borne in mind, that let them consume as much as they can, there still remains enough and to spare in its richness; “neither the coffee nor the cinchona could possibly look better or grow more luxuriantly if they had all the elements of the soil to themselves without any contest or opposition.” In the opinion of this observer the tree will find no spot in Ceylon, excepting a few parts of Uva, capable of affording it anything like the nourishment it requires to develop a bark yielding on analysis such magnificent proportions of the best alkaloids.

Too much stress, however, ought not to be laid on this peculiar advantage; for on the Nilghiris, though the trees grow bushy and spindly in habit, the quality of such bark as was yielded was excellent. Quite recently also bark of *Ledgeriana* has been sold in the London market (said to be from Darjeeling) at the high price of 14s. 8d. per pound. The development in that climate was apparently slower, but it looks as if trees in their full maturity might rival those from Java. In this latter region it appears that “no stem or root bark is ever exported that is not the produce of a tree at least eight years old, and generally of still greater age.”†

At this age, Mr. Moens‡ calculates the average yield for *officinalis* to be 2 lbs. per tree, against 4 lbs. from *Ledgeriana* and 6 lbs. for *succirubra*. *Ledgeriana* is the prince of all, for it appears that even at the low average price of 6s. per lb., the thirteen year old

* *Ceylon Observer*, June 17, 1880.

† *Ibid.*

‡ *Ibid.*, June 12.

plantation, if now rooted up, would yield an average of at least £2000 per acre. (Mr. Moens makes it £4000.) But there is no idea of rooting up trees which, under the process of gradual removal and renewal of bark, will yield a perennial flow of wealth. In this respect the management appears to be much better than in British India. Mr. Moens says: "Our 8½ bouw of *Ledgeriana* has given, within thirteen years, till now 34·619 half-kilograms, say 38·800 English pounds, by thinning, coppicing, and scraping." "And if you saw the gardens at present, you would ask where this bark had been taken, as the plantation is quite close and regular. We took only what was too much, and would hinder the growth of the finest trees."

The size of these finest trees is remarkable. They speak of a *succirubra* tree fourteen years old, 63 feet high and 3½ feet in girth; a *Calisaya* tree seventeen years old, 60 feet in height and 3 feet in girth, and a *Ledgeriana* thirteen years old, 48 feet high and 3 feet in girth.

I will now contrast with these results others obtained in the native country of the *Calisaya*, in consequence of a suggestion of Mr. Ledger, who thus records them in a letter to me under date December 10, 1879:—

"In December, 1849, I was at the farmhouse of a contractor of mine for delivery of a large quantity of bark, in the Yungas of Bolivia. When conversing one evening on the distance that bark had then to be brought out of the forest to where we then were, my friend observed, pointing to the slope of a high mountain on the opposite side of the gully or cañon: 'In my father's time, and when I was fifteen or sixteen years old, from the sides of yonder mountain (*cerro*) we were for two years cutting the best bark I ever saw, almost all was "rojo."' I then said: 'Such being the case, why do you not then plant there 10,000 or 20,000 plants? It is your own property, and, living near, you would in that way have a good fortune for your children.' He did plant some 6000 by March, and in the following year 10,000 more. In reply to inquiries, his letter of September, 1878, I only received in August last. He says: 'Not only I, but all the family, have very good reason to remember your visit to San José. Since 1875 we have cut 500 qs. of bark yearly, and, owing to demand, have sold at an average of 200 dollars per quintal (equal to 4s. per lb.), and there is "cascarilla" (bark) in abundance for ten years. We have planted many thousands of trees since you gave us the idea. — has done the same in Sorata.'"

I have much reason to believe that the supplies thus obtained have found their way to the English market, and that the details above given are correct. These, it will be observed, indicate a lower average quality than that of Java. This perhaps coincides with a more rapid growth of the trees, for Ledger's correspondent says: "We have not weighed the bark taken from each tree," which, however, must be much older than those in Java; "yet I should say that many yielded 3 or 4 quintals of the three classes, *tabla*, *charqui*, and *canuto*. The bark is not all of the best, though every plant was picked."

In a subsequent letter the same correspondent says: "For some eight years we have stripped half the bark off some thousands of trees; about 5 per cent. die. At first we covered the wound with plantain leaves for a year or fifteen months. We find now it is best to plaister the stripped side with mud (*barro*) mixed with plenty of chopped straw or grass, and it answers admirably. When the new bark is well grown the mud covering falls off."

I do not think any of this bark (as imported into London) has had the appearance, or manifested the richness in alkaloid, of the true *Ledgeriana*. Indeed, Mr. Ledger says: "I feel convinced in my own mind, that no white man would or could succeed in getting such splendid seed as my faithful Manuel did. In fact, and as the good poor fellow repeatedly told me, he got seed from particularly fine old trees that we had together seen and sat under. The splendid old tree in Fr. Simon's yard we often (in 1850-51) used to look up at, and wonder the age it could be. It was covered with silvery bright pink moss.* We put its age at over five hundred years. I have often calculated with Manuel that it would yield fully 15 qqs. dry bark of the three classes."

It was in this district, probably, that Dr. Weddell obtained the specimens I have referred to in my 'Origin of the *Calisaya Ledgeriana* of Commerce,' as in the years above referred to Mr. Ledger says they were together in the above districts. I do not believe these were exactly identical with the *Ledgeriana*, though approaching very nearly to it.

The specimens given to me by Dr. Weddell were as follows:—

<i>Calisaya viride.</i>	} Prov. de Yungas, 1851.
„ <i>zambita.</i>	
„ <i>morada.</i>	
„ <i>morada.</i>	
	Prov. de Larecaja, 1851.

* A tree of *Hasskarliana*, aged seventeen years, gave Moens 95 lbs. of dry bark.—*Ceylon Observer*, June 14, 1880; *Pharm. Journ. and Trans.*, Mar. 13, 1880.

Ledger thus describes* what he calls the “rojo” :—“When in flower, the leaves are red underneath. When the seed is ripe and the leaves falling, they are a dark purple. Old trees in particular have on the branches a species of rough moss of a brilliant scarlet colour.”

This is called *Hypoclinus rubrocinctus*, and is represented on the *Calisaya* in Goebel's *Pharmaceutische Waarenkunde*. It used to be looked upon by dealers in London as a necessary indication of the best *calisaya*. Ledger also speaks of the red and dark green leaves as peculiar to this *cinchona*. “I have often,” he says, “seen, when in the Yungas, from the fork of a high tree, the *manchas* far away denoted most clearly by the wind discovering the red colour under the leaves.”

Mr. Ledger sent me, in 1877, specimens of *Calisaya*, two of which were of the “rojo” sort, with white flowers; but all were unfortunately lost in transit. The white flowering *calisayas* would probably be the true *Ledgeriana*, and gathered near the banks of Mamore,† I am more and more inclined to think that the true *Ledgeriana* belongs to Eastern Bolivia, to which district the River Mamore belongs.

It will therefore be understood that the cultivation in Bolivia, although comprising fairly good qualities of *Calisaya*, is not that of *Ledgeriana*, nor can it yield such remarkable results.

A very important reflection is that the cultivation is nevertheless remunerative, and capable of easy and of indefinite extension. The only chance for Indian cultivation in the future consists in the choice of superior sorts, and the efficacy of high cultivation. If these requisites are attended to, considering the greater facilities in India of conveyance to the markets, there is no doubt a great future open to both countries.

It will also be evident that there is practically no limit to the age up to which the *Calisaya* may go on yielding serviceable bark. It does not change with age like the *succirubra*. This is owing to the difference in the tannic acid.

In Bolivia, as in Java, attention is paid to the effectual drainage of the roots. Mr. Ledger says: ‡—“I think you should advise all parties forming plantations to plant on slopes or sides of hills. I never have seen the trees growing on flats or the bottom of gullies. Too much damp at roots is fatal. Almost all the largest and best

* In letter, November 24, 1875.

† See Ledger's letter, December 22, 1874.

‡ In letter, December 10, 1879.

'patches' of cinchona are found on red (dark) soil. The bottoms are black soil."

Examination of a calisaya grown by Captain Cox in Wynaad, in the latter conditions, singularly confirmed to me this observation.

Mr. McIvor's experience led him to the same conclusion. He says,* after visiting Ceylon:—"The red and crown barks seem to do best in Ceylon, as they do here. But on the whole, our cinchona plantations on the Neilgherries give promise of better results than the Ceylon plantations. Ceylon is wanting in the deep rich soils we possess, and cinchona is very liable to canker when the roots get down into the subsoil."

I fear that this must be admitted to have been the cause of "canker" in my *Culisaya Anglica* also. Perhaps in forming the bed, I did not pay sufficient attention to obviating this evil, and it is certain that one deep root found its way beyond where I could easily trace it.

In a recently prepared bed, I have at length effectually shut out the possibility of such mischief.

The following table† of the average prices obtained for the 100,000 half-kilos of bark sent home from Java in 1878, will give a fair idea of the relative value of the different sorts there cultivated:—

Succirubra	.	.	1.75	per cent. per half kilo.
Calisaya Javanica.	.		1.38	" " "
„ Josephiana	.		1.20	" " "
„ Anglica	.		1.58	" " "
„ Ledgeriana	.		6.31	" " "
Cinchona Hasskarliana			1.23	" " "
„ officinalis	.		2.80	" " "
„ lancifolia	.		1.59	" " "
„ caloptera	.		1.35	" " "
„ Pahudiana	.		1.10	" " "

By this it will be seen that the *Ledgeriana* greatly exceeds all the others, and that it equals or excels the cultivated *Calisaya* of Bolivia; but the average of this sort now sent will be much higher, if I may judge from that now selling at Amsterdam.

I wish this remark, however, only to apply to the true *Ledgeriana*, for which as much as 15s. per pound has just been paid at Amsterdam; but in packages recently bought under this name, I find samples at a lower price exactly reproducing the finer calisayas of

* In letter to myself, March 16, 1876.

† *Ceylon Observer*, June 15, 1880.

which I have been treating, but containing not more than half the quinine of the *Ledgeriana*.

I have examined the officinalis bark from the same sale, and find that it resembles in appearance the "knotty sort of Jussieu." It has no reference whatever to the true *C. officinalis*. I am persuaded that this (the *Uritusinga*) has never found its way to Java. In all that I have seen from thence, and in the excellent botanical specimens given me, I find the *angustifolia* indeed, but no trace of the *Uritusinga*.

The important question of the relative proportion of supply to demand will gradually enforce upon the planters the necessity of cultivating none but the best species. I have long been insisting on this point, both as to the cultivation in Java* and in India.

The prospects of the future in Ceylon are almost alarming, at least if we may trust the calculations of Mr. Dobree, Dikoya, Ceylon; published in the *Ceylon Observer* of June 15th, 1880. He says:—

"I see by your Directory of 1876-78 that you estimated the total consumption of cinchona bark for the world at 12,624,000 lbs. In Dikoya and Maskiliza districts alone, during 1880, I believe I am under the mark in saying that there will be 6,000,000 cinchonas, exclusive of those planted in previous years.

"Nearly every other district in the island is also planting cinchonas; and I do not think I am over-estimating the number of cinchonas that will be planted in 1880 throughout the island at 20,000,000; allow 5,000,000 for failures, and add 5,000,000 for plants planted in previous years and now alive, and it will give you 20,000,000 cinchona trees, which in five years will yield—either by taking strips, or mossing, or by the shaving process—about 10,000,000 lbs. of dry bark a year.

"Again, referring to your Directory, I see you estimate the production of cinchona bark for the world at 13,471,000 lbs., of which Ceylon is put down for 150,000 lbs.; but when it produces 10,000,000 lbs., as I believe it will in 1885, the total production of the world will exceed the demand of 1876-78 by 10,847,000 lbs."

It is proverbially uncertain to count one's chicken before they are hatched, and, considering the enormous mortality overtaking the plant (occasionally, if I mistake not, amounting to 90 per cent.), I think the above calculation far too sanguine; but supposing it is correct (for argument sake) to the extent of one-half the estimate, I think I foresee one result. I do not choose to predic-

* *Pharmaceutical Journal*.

—as I never like to do this unless I am sure that my predictions will come to pass—but I think I may fairly anticipate crowded sales-rooms in this market in 1885, at which the representatives of various quinine manufacturers are attending, with the portentous word “rubbish” as a pencil note attached to certain vast consignments of Ceylon bark.

For proof of the probability of this anticipation, I refer to the account I have given of the whole of last year's importations in the *Gardeners' Chronicle*. No doubt much good and profitable bark will also be imported (as now is the case) from Ceylon, and probably this will keep up the price, or nearly so. Dr. Trimen informs me that he has two new plantations of *Ledgeriana* under his care, which are looking very well at present. Abundant information will be found in the *Ceylon Observer** as to the successful efforts of private planters, on which I must not enlarge; but remark, by the way, that renewed *officinalis* bark from Prospect estate, on the Neilgherries, lately sold as high as 12s. 6d. per lb. This was from the true *officinalis*, defined and published as such by Sir Joseph Hooker, and well described since in Bentley and Trimen's “Medicinal Plants.” It is the *Uritsinga* of the “Nueva Quinologia” of Pavon: and this name was retained by McIvor, from whom (before his lamented death) I received excellent specimens grown under his care. It is at the present time flourishing with me, and deserves no doubt the description given by a planter† as being “the largest-leaved variety of the true *officinalis*.”‡ I have leaves up to 9 inches by 6. I observe with pleasure that this writer (W. E. L., of Leangapilla, Ranjala,) says, “I think it by far the most profitable kind to grow in Ceylon.” No doubt both this and bark properly renewed from *C. succirubra* will always command a good price in the market, as being rich in produce of alkaloid suited to the quinine manufacturer.

On the whole, I think it is evident that the true *calisaya* will assert its supremacy as the prince, or, as I should call it, the queen of all the cinchonas. Such indeed is the import of its name as “the best of all barks” for the production of quinine. It is also quite clear that we are as correct in ascribing to Mr. Ledger the introduction of the unrivalled *Ledgeriana*, as we are in speaking of Columbus as the discoverer of America. Mr. L. has the merit

* June 15, 1880.

† I have the *hybrid*, called *pubescens*, alluded to by this writer, growing near, with longer and larger pubescent leaves; but I doubt all hybrids as to permanent good qualities.

‡ *Ceylon Observer*, June 19th, 1880.

of employing the accurate discernment of his faithful Indian servant for collecting the very best seed; and in this he has shown the importance of knowing how to employ and to trust good subordinates—a secret of success in other enterprises than that of the cultivation of cinchona. It is not by evolving theories out of our inner consciousness, but by patient observation of facts, and following out deductions from these to their legitimate results, that the cultivation of calisaya can be advanced. In this way Mr. Moens has the credit of introducing several improvements, which it would prolong this paper to too great a length to describe. I would simply mention the raising of the seed in porous earthenware pans, the subsequent care requisite to be extended over the young plants, the grafting of the *Jedgeriana* on stocks of *succirubra*, and the mode of harvesting the bark by scraping. On this latter point I will remark that it is not in the *calisaya* that we find the striking preponderance of quinine in the outer bark, which I believe I was the first to demonstrate in the face of many authorities to the contrary. In the scrapings of the *calisaya*, so far as appears at present, there is not a greater abundance of alkaloid than in the bulk of the bark. The reason for this is in the difference of microscopical structure between one variety of cinchona and another. I have shown how remarkably this is changed in the renewal of bark of *succirubra*. The “lax* cellular tissue” thus formed is full of alkaloid throughout its whole extent. The whole nature of the bark is thus changed.

A PECULIAR KIND OF CINCHONA BARK.

Dr. PAUL called attention to a specimen of cinchona bark which he said was of interest as showing that it was no longer possible to arrive at even an approximate conclusion as to the value of a sample of cinchona bark from mere visual explanation. The specimen shown was from a considerable parcel of bark that was imported into this country from South America in June, 1879. According to its outward appearance it was of little or no value, and it was ignored by both quinine manufacturers and makers of pharmaceutical preparations. But an analysis of the bark brought out its true character, and showed that it yielded, in addition to mere traces of quinidine, cinchonidine and cinchonine, $2\frac{1}{2}$ per cent.

* See my “Quinology, of the East Indian Plantations.”

of quinine sulphate, so that for either pharmaceutical purposes or the manufacture of quinine it was an excellent bark.

In the discussion which followed, reference was made both to Mr. Howard's paper and Dr. Paul's communication:—

The PRESIDENT asked if there was much of this bark in the market.

Dr. PAUL said there were some large samples.

Mr. WELLCOME asked if Dr. Paul had been able to trace the source of the bark.

Dr. PAUL said not farther than that it was from New Granada.

Mr. GREENISH remarked that the fracture was very short, which indicated parenchymatous rather than prosenchymatous tissue, and taking that only as an indication he should expect it to be rather rich in quinine, because it was in the parenchymatous tissue that the quinine resided.

Mr. WELLCOME said this bark had been creating quite a sensation of late, as a curiosity, owing to its peculiar structure. Instead of being fibrous as other barks were, it had a peculiar crystalline appearance, more like cherry bark. He once saw a specimen which came from Matagrossa, down the Maramont River; he also saw another specimen traced to somewhere in the vicinity, which was shown to him by Professor Flückiger, of Strassburg. It was tested by Dr. Hesse, and found to contain about 2 per cent. of quinine. There had been no similar bark ever brought to America. It had been traced as far as London, but this was the first he had heard of which came by way of Granada.

Dr. PAUL said the first sample was imported in June, 1879.

Mr. UMFREY said one deduction that might be drawn from Mr. Howard's paper was that, private enterprise being brought to bear so largely in the culture of cinchonas, they might look forward in a few years to seeing the Government almost thwarted in their fine commercial speculation in the Neilgherries. That there would be very cheap importations into this country when these private plantations arrived at maturity there could be no doubt.

Dr. SYMES said that not only in this particular kind of bark, but in the ordinary quinine yielding barks, the remark of Dr. Paul was strictly correct, namely, that many of the old features were changing. He had been told by old buyers, that formerly immediately they saw a bark they could tell by its fracture and appearance almost the exact value of it. Those days seemed to be passing away, and chemical analysis was now the only thing to be relied upon.

Dr. PAUL said it was almost invariably the case now that what was formerly considered the best bark, the yellow flat *calisaya*, was almost worthless, containing scarcely any quinine at all, and no alkaloid beyond a little cinchonine.

A vote of thanks was passed to Mr. Howard and Dr. Paul.

The last paper read at this sitting was entitled—

IPECACUANHA WINE.

By J. B. BARNES, F.C.S.

Upon looking over Dr. Dyce Duckworth's paper read at an evening meeting of the Pharmaceutical Society in March, 1872, entitled "Notes on the Pharmacy of Ipecacuanha," it occurred to me that the wine might be improved by a modification of the plan proposed by Mr. Carteighe for the preparation of the acetum and the oxymel of ipecacuanha.

His prescription for the preparation of the acetum is to macerate an ounce of bruised ipecacuanha root in a fluid ounce of acetic acid for twenty-four hours, pack in a percolator, and pour distilled water over it until one pint of percolate has been obtained.

The modification consists in evaporating the acetum thus obtained over a water-bath to dryness, and subsequent maceration of the dry extract in a pint of sherry wine for forty-eight hours, and filtration. By this means a rich brown solution is obtained, which, although made eight months since, has not thrown down the unsightly muddy sediment so well known to be the case when ipecacuanha wine of the Pharmacopœia is kept beyond a few weeks.

A white crystallized deposit of cream of tartar, however, made its appearance in about a fortnight, and the crystallization has gone on slowly ever since, but it differs very much from the muddy mixture of ipecacuanhate of emetia and cream of tartar which continually goes on forming in the wine of the Pharmacopœia.

By this treatment the emetia is converted into the acetate, while from its superior solubility complete solution is insured.

It would, of course, be more rational to use an alcoholic solution of emetia, which Dr. Duckworth states has the same therapeutical effect as ipecacuanha, but similar effects would be obtained by the use of a liquid extract made by exhausting the acetic extract with water containing ten or fifteen per cent. of rectified spirit.

This new wine is slightly acid, but to so trifling an extent as to be not at all likely to interfere with the action of alkalies which

may be prescribed with it. A four fluid drachm dose proved an efficient emetic when given to an adult.

Mr. GREENISH said it was generally admitted that the ipecacuanha wine of the Pharmacopœia was not a satisfactory preparation. If the deposit which fell in the bottles were carefully examined, it would be found to partake of the character of cells, so that no doubt it was due to a fermentation that went on in the wine. He apprehended that Mr. Barnes's paper was founded on Dr. Duckworth's which was read before the Pharmaceutical Society some years ago, when an objection was taken to it. It was admitted that the acetic extract would be an excellent preparation of ipecacuanha, but it was contended that as carbonate of ammonia and other alkalies were so frequently dispensed with ipecacuanha there would be no difficulty in using any acetic preparation. There would not be the same objection to Mr. Barnes's proposal, because he apprehended that the quantity of acetic acid left in the extract when evaporated would be very small. Still there would be a trace. The paper was a very suggestive one and well worthy of attention, and he had no doubt that in the next or some future Pharmacopœia a better or more definite preparation of ipecacuanha wine than the one it now contained would be adopted.

The Conference then adjourned, and in the course of the evening many of the members visited the Hafod Copper Smelting Works and Mills of Messrs. Vivian, and the Landore Tin Plate Works.

Wednesday, August 25th.

The Conference resumed its sitting on Wednesday morning, August 25, at half-past ten, when the first communication was the following:—

NOTES ON A JOURNEY EASTWARD.

BY HENRY B. BRADY, F.R.S.

A few words of explanation, if not of apology, are due to the Conference for the remarks I propose to offer. It has been the custom of the Conference, almost, indeed, one of its unwritten laws, that communications presented to its meeting should be in the form of written papers—mere extempore addresses being too commonly

deficient in the accuracy essential to scientific records to be regarded with favour. But until a few days ago I had no idea that my engagements would have allowed me to be present at this meeting, and still less did I contemplate occupying any portion of the time devoted to its sittings. The position in which I find myself placed is due to some of those I see around me, who have urged that if a member absents himself from one of our annual gatherings for the sake of travelling, the least he can do is to report himself on his return; and as their wish in such a matter is law to me, I have brought a few extracts from my note-book, hoping with their assistance to be able to interest you for the little interval that has been accorded to me. It must be premised, however, that my late journey was not undertaken with any definite scientific object, at any rate none bearing upon pharmacy; its aim was rather change and rest after a spell of hard work.

I have found it difficult to fix the precise points which I might best bring before you, there is so much on such a tour interesting from a pharmaceutical standpoint; but perhaps I can hardly be wrong in centering what I have to say in the island of Ceylon.

I left Marseilles early in February last year, in the M. M. Steamship *Anadyr*, bound for Colombo. There is nothing that need detain us in connection with Naples, Port Said, or Aden, which were the only points at which we stopped *en route*. Passing to the south, the Island of Socotra appeared as a long line of hills with here and there a higher peak, all as barren and desolate as Aden itself. The pharmacist associates little but what is bitter with Socotra, and there is certainly nothing in the appearance of the island from the sea to dispel such an idea.

Colombo is about three-and-twenty days from Marseilles, and somewhat within that time we were at anchor outside the harbour. It would be out of place here to attempt to describe first impressions of tropical scenery, but as we are all more or less botanists, or are supposed to be, a few words on matters connected with the vegetation of the island may be of interest. One of my objects in stopping in Ceylon was to see cinchona trees, and to learn something by observation, of cinchona culture, and to do this it was necessary to visit the mountainous districts far inland. The first stage on an excursion into the interior is to Kandy, the old capital of the island, a distance of 72 miles by railway from Colombo. The line at one point reaches an elevation of from 1600 to 1700 feet, and the scenery by the way is always beautiful, often grand. Endogenous trees, notably the cocoa-nut palm and the bamboo, and in cultivated

patches the banana and other *Musaceæ*, form a striking feature in the landscape; whilst, with greater resemblance to our own forest trees, the bread-fruit and the jack-fruit, the various species of *Ficus*, and the *Poinsettia* with its scarlet leafy tufts, and in the gardens the lettuce-tree (*Pisonia*) with its yellow-green foliage, are amongst those that first arrest attention.

About four miles from Kandy are the Peradenya Gardens, which have been so long and so ably superintended by the veteran botanist, Dr. Thwaites. The primary object of the gardens is botanical and economic, rather than merely horticultural. I had the advantage of the company of Dr. Thwaites during the long morning I spent there. Amongst the conspicuous medicinal and economic plants in the grounds are the pimento (*Eugenia pimenta*), a beautiful evergreen tree, which though it grows freely enough, is not cultivated in Ceylon on a commercial scale; the black pepper (*Piper nigrum*), indigenous in the forests of south-western India, though probably not in Ceylon, which flourishes like a weed, its slender jointed stems with large ovate leaves climbing like ivy amongst the trees; the nutmeg (*Myristica officinalis*), a fine spreading tree some 40 feet high, with beautiful evergreen foliage; the cinnamon (*Cinnamomum zeylanicum*), which when allowed to grow unchecked is a forest tree—concerning which I shall have more to say presently; *Ficus elastica*, one of the india-rubber trees, and the banyan (*Ficus indica*) with its wonderful aerial roots; the palm-oil tree (*Elwis guineensis*); the jaggery-palm (*Caryota urens*); the sugar palm (*Saguerus saccharifer*); the betel-nut (*Arca catechu*); and the talipot (*Corypha umbraculifera*), a fine specimen of which was in flower. By the river side are clumps of bamboos a hundred feet in height, with stems thick enough to make buckets of. The mango (*Mangifera indica*), in size and appearance not unlike an apple tree, was already in fruit; cocculus indicus (*Anamirta cocculus*), an indigenous, climbing, shrubby weed, was at home amongst the trunks and branches of its larger neighbours; and besides these there were a number of plants cultivated experimentally,—vanilla, cardamom, cacao, and the like,—to which I must more specially advert.

As you well know, the island of Ceylon owes a considerable proportion of its wealth to the cultivation of coffee, and you may also know that for some years past the plantations have suffered from the spread of a leaf disease caused by a minute fungus, *Hemileia vastatrix*. The ravages of this pest have increased to such an extent, that two years ago the loss to the island from injured crops was estimated at not less than two million pounds sterling per

annum. The fact that the disease has been most prevalent and most destructive at elevations of about 3,000 feet—that is in the regions which have been longest under coffee cultivation—seems to indicate that the gradual impoverishment of the soil and the consequent deficient vigour of the plants, are probably at the bottom of the mischief. Be that as it may, of recent years the planters have directed their attention to other possible sources of income, and in this way the experimental culture of other plants used in medicine or for food has undergone a fair trial. Of these the most important to us are cinchona, vanilla, cardamoms, and ipecacuanha; but there are in addition tea, cacao, and Liberian coffee, all of which have been introduced to a greater or less extent.

To see cinchonas under cultivation it is necessary to go much farther into the mountainous district, and I determined to visit the Government nursery at Hakgala. The journey from Kandy to Nuwera Eliya, the great health resort of Europeans, is performed partly by rail, partly by a vehicle called in courtesy a stage-coach, and the remainder by any conveyance you can manage to hire. It is a difficult mountain road, reaching at one point an altitude of something like 6,700 feet, and it lies through varied and beautiful scenery.

One first sees *Cinchona succirubra* in this district at a height of 3,000 feet. The trees are not very large, and at a distance they bear considerable resemblance to small sycamores: they are planted chiefly near the roads, but sometimes distributed amongst the coffee shrubs. Much higher on the mountain slopes, that is at an altitude of 5,000 feet, tea plantations are noticed, the Assam variety being that preferred for cultivation. It was dark ere I arrived at Nuwera Eliya, and the mountain air was so keen that a blazing fire on the hearthstone of the hotel was a welcome sight, though within a few degrees of the equator. In the morning I noticed that two fine specimens of *Eucalyptus globulus* in front of the hotel had their leaves shrivelled and brown from the frost of the previous evening. The eucalyptus has been largely introduced into the highlands of Ceylon, and it appears to thrive down to about 2,000 feet elevation. The two specimens alluded to I estimated as from 50 to 60 feet in height.

The Hakgala Gardens are about seven miles beyond Nuwera Eliya, and have an elevation of a little over 6,000 feet. They were established on the introduction of cinchona culture, just twenty years ago, by Dr. Thwaites, and are now under the superintendence of his brother. Mr. J. E. Howard, in the interesting paper which we

heard yesterday, mentions the *Ceylon Observer* as the authority for some of his facts, and I should like to say here that it is to the editor of that journal, Mr. Ferguson, who is himself an experienced cinchona grower, and to Mr. Thwaites, that I am chiefly indebted for the information I obtained on the subject. Mr. Howard's paper has forestalled a good deal of what I might otherwise have said, but this is of the less consequence, as his details are posted to a date much later than my visit. To speak with critical accuracy of the species of the genus *Cinchona* is quite beyond my power, and whilst there is so much difference of opinion amongst botanists who have given great attention to the subject—Weddell, Bentham, Hooker and others recognising forty or fifty species, whilst Kunze admits but four—we may be content to leave the matter undiscussed. For our purpose the interest of the genus centres in the three species, *C. officinalis* (with its variety *Condaminia*), *C. Calisaya* (with its variety *Ledgeriana*), and *C. succirubra*.

In Ceylon the cultivation has hitherto been very much confined to *C. officinalis* and *C. succirubra*, the latter of which grows best at elevations of from 2,000 to 4,500 feet, whilst the former seems equally at home up to 6,000 feet. At Hakgala a plantation of these two species, fourteen years old, was cut down a year before my visit, and yielded an average of 3 lbs. of bark per tree, which sold in the London market at 5s. 6d. per lb. I measured some of the stumps of *C. succirubra*, and found them seven inches in diameter, indicating a very slow rate of growth as compared with the South American plantations mentioned in Mr. Howard's paper. It is customary to plant *officinalis* about three feet apart, and *succirubra* about four feet apart.

There seems considerable doubt how far true *Calisaya* has been grown at all in Ceylon. Mr. Thwaites thinks that nearly all the plants grown under that name have been hybrids. Of their so-called *C. Calisaya Ledgeriana*, there appear to be at least three varieties, of distinct habit and mode of growth. But Mr. Ledger's own seed has produced different results in Ceylon from those obtained from it in the Neilgherries, and the comparison of these with specimens grown in Java only increases the difficulty of determining the botanical characters of the species under cultivation. There has been a great demand for plants of *C. Calisaya*, and advertisements had appeared in the newspapers offering £12 per thousand for guaranteed *Ledgeriana*, whilst young plants of *officinalis* and *succirubra* could be bought for one-tenth of that price. *C. Calisaya* appears to grow better at low elevations than the other species, and

at Batticaloa it has been cultivated down to the sea level under cocoa-nut trees. At high elevations it assumes a shrubby habit; but it seems to die off at a certain age, and in common with *C. officinalis* is subject to canker, that is, the bark splits, swells, and peels off. This is probably owing, as suggested in Mr. Howard's paper yesterday, to want of sufficient depth of good well drained soil. The process of "mossing," which has been so successfully practised elsewhere, does not seem to answer in Ceylon, the reason assigned being that the mossy coverings serve as a harbour for ants.

With regard to the extent to which cinchona culture has been carried, the figures I obtained differ widely from those of Mr. Howard's correspondent, and as they represent the estimate of one who has exceptional facilities for ascertaining what is being done, they may be worth repeating, even though they are more than a year old. At the time of our interview, Mr. Ferguson thought that there were about 6,000 acres of cinchonas under cultivation, and that in five years there would, at the present rate of increase, be about 5,000,000 cinchona trees of one species or other in the island: but without official returns it must be very difficult to arrive at even approximate numbers.

Next to cinchona growing, perhaps the most important recently introduced industry, from a medical standpoint, is the cultivation of the cardamom. The true Malabar cardamom (*Elettaria cardamomum*) is not indigenous to Ceylon, though an allied species, perhaps only a variety (*E. major*), grows wild in the forest. It is an endogenous, herbaceous plant, with long tapering leaves, not unlike those of an iris, but some eight or ten feet high. The bulbs are planted about eight feet apart, and begin to bear fruit at the end of the third year. They give two good crops, and then a small one, after which they are taken up and a fresh lot planted. Advertisements appear in the newspapers offering the bulbs for sale at a price of about 40 rupees per thousand.

Vanilla (*Vanilla planifolia*) is now cultivated in many tropical countries, but has only recently been introduced into Ceylon. I saw but one experimental lot. This was in a moist, shady place, and the plants were trained on slanting poles, a foot to eighteen inches apart. It begins to yield fruit in about three years, and goes on bearing almost indefinitely. That its culture has been undertaken in earnest, I gather from the fact that I heard of one planter who had a line of plants three miles in length.

Ipecacuanha (*Cephaelis ipecacuanha*) has also been introduced,

but I did not gather that its cultivation had been attempted on any great scale. It is a little shrubby plant about a foot in height, and could probably be grown without much difficulty; but Dr. Thwaites thinks that commercially it could only answer under pot culture at native houses, where women and children could attend to it.

Returning to the lowlands, my first desire was to see something of the cultivation of the cinnamon on the commercial scale, and the preparation of the bark for the market; so, furnished with suitable introductions, I took the steamboat from Colombo to Negumbo, a little fishing village about twenty miles up the coast. Thence a drive of three miles inland brought me to Kimbulapitia, an estate of about 400 acres, superintended by Mr. W. Carry, one of the most successful cinnamon growers in the island. The cinnamon (*Cinnamomum zeylanicum*) is a native of Ceylon. When allowed to grow it is an evergreen tree of considerable size, flourishing at every elevation up to 3,000 feet, one variety to almost the highest points of the island. Its cultivation, however, is confined to the south-west coast, from Negumbo to Matura, as the light sandy soil within a few miles of the sea is best suited for its growth. Under cultivation it is never permitted to assume its natural arborescent form, but is coppiced, and becomes a bush like a hazel, with a thick woody stool and long straight shoots. For the first three years the plants produce nothing of marketable value, and during the next three only here and there a stick, but after the sixth year the bushes are in full bearing, and go on for forty or sixty years. The shoots are cut when they are a year and a half or two years old, three to six feet long, or even more, and as thick as a walking stick. The beds are kept carefully weeded, the weeds burned and the ashes used as manure; the roots of the bushes are always kept well covered. My guide laid great stress on these apparently little matters. The finest quality bark is obtained from green stems, the cutting of which injures the plant more or less, and it is said that such bark does not pay to produce under 4s. 6d. to 5s. per lb. Our excellent curator, Mr. Holmes, asked me, before I left home, to make some inquiry concerning one or two very distinct varieties of cinnamon which appear in commerce; but I found it difficult on the spot to obtain any satisfactory information. Mr. Carry stated that there were not less than fifteen varieties, sufficiently distinct in flavour to be easily recognised. The sticks, after being cut, are carried to the "wadia," or peeling shed. They are there trimmed, and the rusty cuticle which is the beginning of the corky layer of the bark is removed by scraping whilst the end of the stick is held

down by the heel of the worker. The older the shoot of course the more scraping it requires. A curved knife, pointed at the end, is used for peeling. A longitudinal slit is made and the bark loosened by working the point of the knife underneath it, when it comes off in fragments from an inch to a foot in length. If the weather has been dry, the peeling is facilitated by rubbing the stick all round with a smooth piece of hard wood. The strips of bark are laid longitudinally, the ends over-lapping, till they make up lengths of between three and four feet, the smaller pieces being placed inside the larger, to about an even thickness. In this condition the lengths are placed side by side in rows, on strings stretched overhead, and as they dry they gradually close up and form the long thin sticks we all know. They are inspected from time to time, and any irregularity in closing up is corrected. This process occupies about three days, after which the drying is completed by exposure to the sun for some days longer. The produce of the Kimbulapitia estate is from 300 to 400 bales of 100 lbs. each, per annum. A uniform price of $4\frac{1}{2}d.$ per. lb. on the weight of finished bark is paid for labour.

I subsequently visited a neighbouring property where cinnamon oil was distilled. The appearance of the plantations was in strong contrast with those I had just left—the beds were weedy and ill kept, and the bushes in poor condition. The still-house was an open shed: the stills were of copper, apparently of about 50 gallons capacity, and of the most primitive construction. The spent bark was employed in part for firing. About 40 lbs. of cinnamon chips were used for each charge, and they were macerated some hours before being put into the still. It has been stated that sea-water is employed for this purpose, but such was not the case in this instance. The distillation occupied six hours, and two charges to each still were worked per diem. About three ounces of oil resulted from each operation. The distillate was collected in a series of cylindrical cans, each with a spout inserted in its side, about one-third the way up. These were arranged on steps one below the other, to act as separators, the heavy oil being deposited in the bottom of the cans. The total produce was stated at about 120 bottles of oil per annum.

At the present time, however, the cultivation of cocoa-nuts in the lowlands near the sea pays better than either cinnamon bark or cinnamon oil, and through the kindness of the gentleman already named, I was enabled to see something of the way in which this is conducted on a commercial scale. There is a very common belief

that the cocoa-nut palm will only grow near human habitations, and this is so far true that in country districts, wherever you find a clump of cocoa-nut trees, you may assume there is a village, even though you cannot at the moment see it. Various explanations, more or less plausible, have been offered of the fact, if it be one. Mr. Carry attributed it chiefly to the smoke from the dwellings favouring the growth of the palm. His own plantations were kept very clear of other vegetation: all dead leaves were carefully collected, thrown into pits, thoroughly wetted, and then slowly burned, so that the largest possible amount of smoke might be produced under the trees. About 80 palms are planted to each acre, the trees being 21 or 22 feet apart; and each of these yields about 59 cocoa-nuts per annum, that is about 4000 nuts per acre. The cocoa-nuts sell at 60s. per thousand, and as the cost of cultivation is only about 40s. per acre, a large margin of profit is left.

There are several cocoa-nut oil mills at Colombo, and I paid a visit to that owned by Messrs. Leechman & Co., which perhaps is the most extensive of them. The process adopted is a very simple one. The white portion or pulp of the cocoa-nut is dried, roughly powdered, and then pressed by means of machinery similar to that employed in this country for rape or linseed. The dried pulp yields about 60 per cent. of its weight of colourless limpid oil. A native can hardly be made to believe that this oil, which he knows only as a thin fluid, is a white solid fat when it arrives in England. I recollect well when travelling in the interior of Morocco, the look of pitying incredulity with which I was met by certain Moors of more than common intelligence, when I told them that in my country, in winter, the water was hard and solid, and that you could sometimes even walk across the rivers. But possibly we may sometimes take home, even to ourselves, the saying of an old Spanish chronicler, when commending for acceptance a story making heavy demands on the credence of his readers, "None but light and inconsiderate minds hastily reject the marvellous—to the thinking mind the whole world is enveloped in mystery."

I must not linger over Ceylon; indeed, I have already occupied more of your time than I intended; nor shall I detain you with my visit to Singapore, though the botanical gardens contain much of interest and the fruit market has many products that are novelties to a European. In the Straits Settlements, as in Ceylon, the cultivation of Liberian coffee is exciting much attention, and their seedling plants, seventeen months old, were already beginning to bear fruit when I was there.

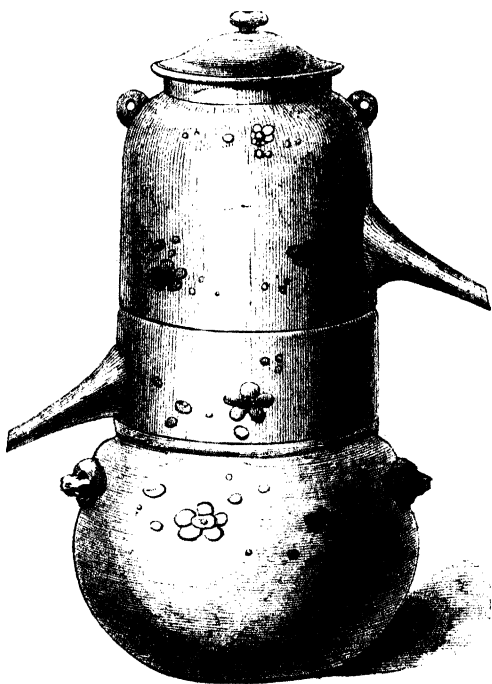
I would gladly enlarge somewhat on my stay in China did time permit, for the country, or at any rate its people, afford rich material for study in whatever aspect they are approached. The language is of course the great obstacle to obtaining information. I had the pleasure of visiting some of the drug shops of the native town in Shanghai in company with Mr. Fryer, an accomplished Chinese scholar,—the translator of many European scientific works into their difficult language. Here we found an assortment of wonderful remedies, of which Tertiary fossils were not the least important. The bones of extinct species of *Rhinoceros* and *Elephas* and the fossil teeth of several carnivorous animals, under the names of “dragon’s bones” and “dragon’s teeth,” are amongst the most highly prized articles of Chinese materia medica. Dragon’s teeth are said in their old books to cure heart-ache and stomach-ache, to drive away ghosts, to cure colds and dysentery, fainting in children and nocturnal alarms, and to increase the general health. Who would not like to possess a dragon’s tooth? We are told that they are only genuine when they adhere to the tongue.

I would willingly also linger over Japan, but must perforce confine my remarks to one or two subjects. At Kōbe the air was redolent of the familiar scent of camphor from a pile of tubs of the crude drug waiting on the quay for shipment. At Osaka I was hospitably entertained by an old member of the Conference, Mr. W. Gowland, who for several years has held a high position in the Imperial Mint, and is in fact responsible for the coinage of the country, which now holds an excellent character in the East.

At Tokio, my friend, Dr. R. W. Atkinson, the Professor of Chemistry in the University, drew my attention to a pretty little earthenware distilling apparatus, in use amongst the Japanese, which I have much pleasure in introducing to your notice.

The accompanying sketches will, I think, be readily understood. It consists of four pieces: a boiler, *a*, on to which fits a short cylinder, with a perforated bottom, *b*, and over this a condenser, *c*, with a cover, *d*. The cover being removed, a stream of cold water can be kept running into the condenser by means of a bamboo, and the overflow carried off by the spout at its base. Round the base of the inner side of the middle cylinder runs a ledge which forms a channel opening into an exit spout. The materials for distillation are put into the boiler, and the whole is placed on the ordinary *hibatchi*, or domestic fire-box. The vapour passes through the perforated bottom of the cylinder, collects in drops on the dome-shaped inner surface of the condenser, runs

down into the channel before described, and is collected at its exit from the spout. This little contrivance is known by the Japanese under the name of *lambik* or *rambiki*, which is doubtless some corruption, through the Dutch, of the word alembic. In the country districts peppermint is largely used as a corrective for water rendered muddy and otherwise unsuitable for drinking by rains, as well as for other domestic purposes, and this apparatus is one



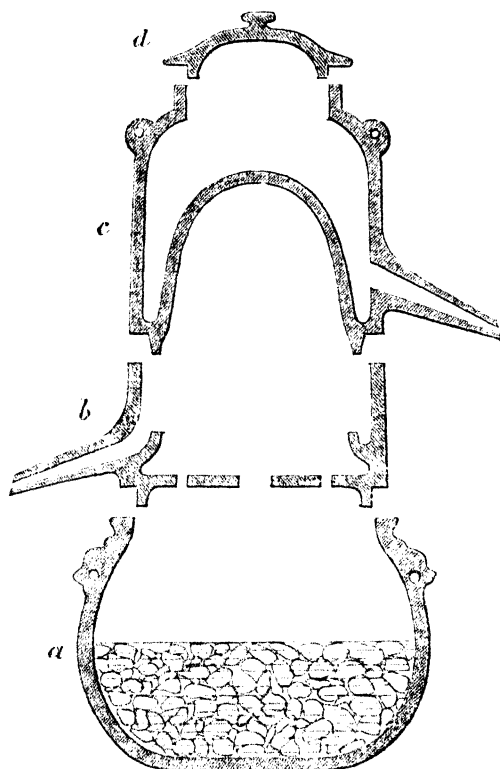
of the means employed for its distillation. Whether it may afford any hints of which advantage may be taken in our laboratories, I must leave you to determine.

The PRESIDENT said the Conference was much indebted to Mr. Brady for the extremely interesting account he had given of his journey. The subject of cinchona cultivation itself was one which was almost unknown to the world in general, and it was only those

who, like themselves, had connection with it, had any conception of its magnitude.

Mr. SCHACHT drew attention to a fine collection of photographs which Mr. Brady had brought with him and which were open to inspection.

Mr. WHITE thought it would not have been inappropriate if Mr. Brady had pointed out what a lucrative culture the cinchona was.



It was once said that the most lucrative culture in the world was early spring radishes in the neighbourhood of London, as they gave a larger return per acre than any other product, but after what they had heard about cinchona, he was led to believe that perhaps it produced a larger amount of profit when cultivated than any other known article. He had been told that as much as £1000 per acre had been acquired from the cultivation of this tree in Ceylon, and if this fact were pointed out, it would be an incentive

to increase the culture, which of course would tend to lower the price and confer great benefits on mankind.

Mr. BRADY, in reply to Mr. White's observations, said that it was altogether too soon to attempt to determine the eventual profits to be derived from cinchona culture. At the present time, of course, those who had bark to sell were in an enviable position; but it was a question of supply and demand, and if the state of things foreshadowed in Mr. Howard's paper should ever come about, the bark from our eastern plantations could not possibly continue to realize its present value.

Mr. GREENISH said he was glad to hear Mr. Brady's remarks with respect to the coffee plantations being injured by the exhaustion of the soil. Six years ago he was in Portugal during the time of the vintage, when he was asked by a Portuguese gentleman if he could in any way account for the fungoid disease on the fruit and the phylloxera on the root. Just in front of the house was a vineyard which was very productive, and at that time they were gathering the crop. He made a calculation, and pointed out that every year they were taking away so many tons of grapes from the vineyard, and not even the leaves that fell from the trees were allowed to remain on the ground. It was, therefore, simply a question of time when they would cease to have any grapes at all.

Mr. WOOTTON said no doubt Mr. Brady when in Japan heard of the complaints against the Japanese Government with reference to drugs from England, many of the English wholesale druggists having complained very bitterly. He had heard of it from a gentleman who had lived for many years in Yokohama, who said the matter was now before the British Foreign Office. The complaint was that the Government analysts condemned English exports of drugs to a very great extent, but not until they had allowed the duty to be paid for them. It sometimes happened that, after they were condemned and not allowed to be sold, certain persons would go to the owner of the property and offer him a small price, which he was glad to take rather than ship them back to England. Of course only one side of the question was heard here, and he had no means of knowing what the views of the Japanese Government were. They seem to have acted pretty fairly to a great extent, for although they appointed native analysts in each of the ports to which English goods were sent, they appointed an European superintendent. He believed in Yokohama this superintendent was a Dutchman, because Dutch imports were the smallest, and it was thought that his judgment would be less

biased than an Englishman's or a Frenchman's. He did not know whether Mr. Brady could give any opinion on the matter.

Mr. BRADY, in reply to Mr. Wootton's question as to the grievances complained of in connection with the importation of drugs into Japan, said the matter had scarcely begun to attract public attention when he was at Yokohama, and he had heard little about it. That the Japanese had a faculty for devising both import and export duties on every conceivable thing on which it was possible to raise money was a fact well and widely recognised. The appointment of a Dutchman to the superintendence of this department of the revenue should not, he thought, be attributed to any preference for the representative of a country doing only a small trade, but rather to the old standing commercial relations of the Japanese with Holland, dating back to a period long anterior to their commerce with this country.

Mr. UMNEY said when he heard Mr. Brady speak of a Newcastle engineer at the cocoa nut oil factory, he could not help wishing that some enterprising cinnamon grower had sent here for a manufacturing pharmacist to conduct the distillation of his cinnamon oil. He could say safely there was no product which came into the London market which pharmacists were bound to use (for 95 per cent. of the cinnamon oil was imported) which was so unsatisfactory, and required so much care in selection. Cinnamon leaf was distilled, and of course its distillate came into the market as a distinct product, but he believed sometimes cinnamon leaves found their way into the still, and that very much deteriorated the quality of the oil. At any rate, that some inferior qualities of bark found their way into the still with the superior qualities there could be no question. Again, referring to the primitive way in which the distillation was carried on, they could now well understand how different cinnamon oils varied so much. Chemists knew that cinnamon oil was made up of two products, the one a light and the other a heavy oil. The bulk of it was a heavy oil, and he should like to ask Mr. Brady whether he had observed if there was a light and heavy essential oil separator at the stills. He should say that to distil cinnamon 40 or 50 pounds at a time was about the worst way of going to work economically that could possibly be devised, unless the water was returned again and again to the still for redistillation with fresh portions of cinnamon.

A vote of thanks was then passed to Mr. Brady.

The next paper read was a—

NOTE ON INDIAN HENBANE.

By THOMAS GREENISH, F.C.S., F.R.M.S.

Among the samples of interesting drugs which reach the Museum of the Pharmaceutical Society, either through its honorary and corresponding members, or other scientific men, the products of India, our own colonies, or those of other countries, there is an ample field for scientific research, and one in which the youth of our profession may serve the cause of pharmacy, and at the same time earn distinction for themselves.

It is, from every point of view, desirable that the numerous vegetable products of tropical and other countries, introduced as remedial agents, should, as early as may be convenient, be thoroughly examined, and if there be present in any one of them an active proximate principle or residual agent, that it may be recognised as an aid to therapeutic science or, on the contrary, if possessing only some astringent or other less valuable constituent, it may be relegated to its proper place as an addition to a class of bodies of which we at present possess so ample a store.

It is sometimes difficult to determine whether it be a loss to therapeutics or a gain to true pharmacy, but, nevertheless, there is a fact, and it is daily exemplified, that the more plentiful supply of the raw material sends a large number of new therapeutic agents into the list of forgotten or neglected remedies.

The official biennial henbane leaf has of late years become very scarce in this country, and it was with considerable interest that, at the request of Mr. Holmes, I undertook the examination of a small sample of henbane leaf sent from India. It arrived in a tin box without any particulars as to its being the produce of the annual or biennial plant, place of growth, character of soil, the result of cultivation, or otherwise. The quantity at my disposal was only $3\frac{1}{2}$ drachms. On removal from the tin the leaves had a clammy feel; they possessed an intense odour, on the hand very persistent, and generally stronger than that of any henbane that had previously come under my notice.

With so small a quantity of leaf the tincture seemed the most suitable official preparation to make. For this purpose it was placed in a drying closet at a temperature of about 80° F., and with a loss of 14 grains, or 7 per cent., was reduced to a coarse powder as directed in the Pharmacopœia. It was remarked how

quickly and almost entirely the peculiar odour of the henbane, just referred to, passed off in the process of drying.

The tincture was prepared by maceration, and after standing the usual time, pressed off and filtered. Compared with the official tincture of the British Pharmacopœia, made with biennial henbane, by transmitted light it was brown olive, whereas the official tincture is olive-green, and the colour more intense. A little of the tincture of Indian henbane added to water produced no opalescence, and gave only a tinge of colour; the official tincture, on the contrary, produced considerable opacity, which, on the addition of a little liquor potassæ, disappeared.

In the general structure of the leaf I could perceive no very material difference, but a section of the midrib showed much more vascular structure than one from the same part of indigenous biennial henbane; but more extended observation will be required on the histology of the two plants before any definite conclusion can be arrived at as to their identity.

Extracts made from the two tinctures were relatively 3.43 for the Indian henbane, as compared with 4.20 for the British Pharmacopœia; but on this point also further experiment, and with larger quantities, is desirable.

As regards the difference in colour, it is probable that under a tropical sun one of the elements of the chlorophyll of the Indian henbane had been in part decomposed, and hence the brown of that tincture as compared with the green of the official. The two samples also were respectively viewed in the spectroscope, when the Indian tincture showed an absorption band in the red, smaller, and not so clearly defined as that of the tincture from the indigenous biennial. This would also indicate a loss of chlorophyll as just referred to. The relative difference in the yield of extract of the two tinctures may receive its solution in the greater vascular development of the Indian as compared with the indigenous leaf. The quantity of tincture was too small for reliable conclusions as to any difference in the therapeutic value of the two tinctures. That question must be left to a larger supply of material for its solution.

Pereira, quoting Mr. Houlton, states, in reference to indigenous biennial henbane that, "when fresh it has a strong, unpleasant and narcotic odour, a mucilaginous, slightly acid taste, and a clammy feel, and that by dryness it almost wholly loses these properties." Reference has already been made to the more intense odour of the Indian henbane, and it may therefore be worth while

to determine on a small quantity of a given sample the amount of loss suffered in the process of drying, and allowing for that loss to make a tincture with the leaf without previously drying it, so that the strong odour which is probably due to some volatile principle, and also the acidity, may together be retained, and probably increase the therapeutic value of the product.

It is to be wished that a larger supply of this henbane leaf, with full particulars on those points of its history previously referred to, may reach this country, for the institution of more exact experiments to determine the relative value of the two henbanes; but these references may serve to turn attention to another probable source for an official plant now, and for some years past, very scarce in this country.

I am inclined to think that the Indian henbane, from its very intense odour, probably the result of climatic influences, may supply a therapeutic agent more volatile than any one of the official preparations from indigenous henbane.

The PRESIDENT said the thanks of the Conference were due to Mr. Greenish for an interesting paper on a practical subject. The pith of it really lay in the few last words. He did not know whether any quantity had been hitherto imported.

Mr. REYNOLDS said the subject of henbane was likely not to diminish but to increase in interest. Some few years ago it was under a cloud, and people spoke of it very disparagingly, some medical writers regarding it as one of those tinctures which could be given in any quantity up to an ounce without either good or harm. The introduction of hyoscyamine in a state of greater or less purity, for which they were chiefly indebted to M. Merck, of Darmstadt, had led to a change of opinion, and it had been used to a considerable extent lately in the leading asylums, and originally in the West Riding Asylum, by Dr. Robert Lawson, who in the "Medical Reports" of the institution, vol. vi., called the attention of the profession to it, and it was now recognised as one of the most valuable remedies for controlling the excitement of mania. The only case in which Merck's extractive hyoscyamine had been disappointing to those who had used it, as far as he was aware, was where it had been made from the root of the plant. Usually Merck used leaves, and the greenish colour had been regarded by medical men as one of the tests of a reliable hyoscyamine. There could be no question that

any new source for hyoscyamine would be scarcely less interesting to pharmacists than a new source for morphia, or any of the drugs in most constant use.

Dr. SYMES said the Conference was much indebted to Mr. Greenish for explaining this new source for replacing a diminished supply, and he was pleased to hear that notwithstanding Mr. Greenish's criticism on what he said the previous day in defence of new remedies, he thought it very necessary that attention should be given to new drugs when they were brought to this country. It occurred to him from the facts stated, that the tincture from Indian henbane did not become opalescent when mixed with water, that it was a characteristic of English henbane made from annual leaves that it did not become opalescent, and had been shown to be very nearly harmless, whilst that made from biennial leaves did become opalescent. He had recently had very good evidence that hyoscyamine was gradually growing purer than originally. There was certainly a difference in two samples supplied by the same manufacturing chemist. A medical man was prescribing it in one-twentieth of a grain doses; it had been dispensed twice; but when it was dispensed with a new supply, the first dose produced almost blindness and intoxication, so much so that the patient's employers thought he had better go home and recover himself before continuing his duties. The dose was precisely the same, and he could only attribute the intoxication to the greater activity in the hyoscyamine.

Mr. MASON asked if Mr. Greenish had examined German henbane comparatively.

Mr. GREENISH replied in the negative.

Mr. UMNEY thought the first important point to decide was whether the biennial henbane was the only active kind, and whether the annual kind was inert. He was pretty confident that the henbane from India was a plant that grew, flowered, and died annually. The German henbane also, he believed, was an annual variety; from this there could be little doubt that Merck prepared his hyoscyamine. He was of opinion that what they heard of the greater activity of the biennial henbane was to a great extent moonshine. The scarcity referred to would continue so long as they drew it solely from home supplies, and did not use that from the Continent, India, and other countries. The cultivation of biennial henbane was already becoming almost a monopoly in two or three hands, and they would probably see it get dearer year by year until some one undertook a properly

experimental investigation of the medicinal properties of the two varieties, and the manufacture of hyoscyamine from the annual variety.

Mr. GERRARD said on the breaking up of the Indian Museum and the distribution of the specimens a number of them fell into his hands, and among them was a specimen of an Indian grown henbane. It was very interesting, and had just the description given by Mr. Greenish. He took a few hundred grains of the leaf and submitted it to extraction by alcohol. The extract was treated with water, filtered, and that solution was treated with Mayer's solution. The precipitate was weighed, and a parallel experiment being carried on with biennial henbane, a quantity of the weighed precipitate from each approximated so closely that there could not be said to be any difference in the amount. Judging by that observation, it would appear that the yield of alkaloid matter from this Indian henbane would be nearly the same as from the English grown plant. He should like to know whether this Indian henbane was a commercial article. He feared it was not, but he should like to get a large quantity of it; he could then get the necessary therapeutical experiments made. There had recently been brought into the London market an extract of *hyoscyamus* which was offered as Japanese. It was the colour which might be expected in old extracts, not a green, but a brown extract, in which apparently a great deal of heat had been used carelessly in evaporation. He thought it not at all impossible that if it were offered in the market it might be made use of, and offered as English, by the admixture of a little chlorophyll. This was submitted to the same examination he had already described, and the yield of alkaloid matter as compared with the English was certainly greater; but he did not isolate the alkaloid absolutely as hyoscyamine, the quantity in his hands not being sufficient. When they considered that the percentage of hyoscyamine was stated by Hanbury and Flückiger to be 0.05 per cent., it was evident that an ounce of extract would hardly yield enough to form a good judgment of its value.

Mr. GREENISH said that when there was a demand for a new supply of anything of this kind, it was ample justification for calling attention to it. With regard to the trade supply, Mr. Holmes was in communication with Dr. Dymock on that point, and he had little doubt that by-and-by any quantity could be supplied. There was another important point, and that was that a tincture of the root of henbane was now being used, and he

requested Mr. Holmes to try and get some of the root from Dr. Dymock, so that experiments might be made on that. He believed the tincture made from the root from India would be stronger than that made from the root grown in this country.

Mr. BRADY thought it probable there might in the future be exported from Japan a number of such preparations as extract of hyoscyamus, and even of things more purely chemical. There was a great ambition on the part of the Japanese to rival European manufacturers, especially in matters requiring education and skilled labour. They were now attempting to make quinine on a considerable scale, and at some of the government hospitals they would scarcely allow preparations not of home manufacture to be used, even although they had to pay many times the price for them. There was a rapidly rising body of educated men in Japan capable of holding their own with Europeans in these as in other matters.

A vote of thanks was passed to Mr. Greenish for his paper.

The next paper was entitled—

FURTHER NOTES ON PETROLEUM SPIRIT AND ANALOGOUS LIQUIDS.

By ALFRED H. ALLEN, F.I.C., F.C.S.

At the Sheffield meeting I laid before the Pharmaceutical Conference the results of my experiments on certain tests for distinguishing commercial petroleum spirit, or "benzoline," from coal tar naphtha, the true benzol or benzene.

Additional experience has fully confirmed the opinion I then expressed as to the value of these tests, but it has shown that the subject was by no means exhausted.

The great competitor with petroleum spirit, in a commercial sense, is the highly volatile and inflammable spirit obtained as a secondary product in the manufacture of paraffin wax and burning oil from the bituminous shale of the south of Scotland. This liquid, which may be conveniently called "shale naphtha," is commonly described as consisting essentially of a mixture of hydrocarbons of the marsh gas or paraffin series. As in physical properties the shale naphtha presents the closest resemblance to petroleum spirit, both liquids being, in fact, known in commerce as "benzoline," and as

they are usually stated to be identical in chemical composition, I supposed that the reactions which I found characteristic of petroleum spirit would be equally applicable to shale naphtha. Experiment has shown, however, that this is not true in all cases. In fact, the observed differences in the behaviour of the two liquids with certain reagents point to a much wider divergence in their chemical composition than is commonly suspected to exist.

The test which I have found most serviceable for distinguishing petroleum spirit from shale naphtha, and both of these from coal-tar benzol, are the following :—

1. The solvent action of the sample on coal-tar pitch.
2. The behaviour of the sample with anhydrous carbolic acid (Calvert's No. 2).
3. The reaction of the sample with nitric acid.
4. The behaviour of the sample with bromine.

The following table exhibits in a convenient form the behaviour of the liquids in question with the two first named tests, the reactions with nitric acid and bromine requiring separate and more detailed consideration.

To facilitate comparison, I also give the specific gravities and boiling points of the samples examined. They were ordinary commercial specimens, not purified in any way :—

Mode of Treatment.	Petroleum Spirit.	Shale Naphtha.	Coal Tar Benzol.
a. Specific gravity of sample.	·690	·718	·876
b. Boiling point of sample.	65° C.	66° C.	80° C.
c. Solvent action on coal-tar pitch.	Very slightly solvent action on pitch; liquid but slightly coloured even after prolonged contact.	Behaves similarly to petroleum spirit.	Readily dissolves pitch, forming a deep brown solution.
d. Behaviour of the sample when three measures of it are shaken with one measure of fused crystals of absolute carbolic acid.	No apparent solution. The liquids are not miscible. For the real nature of this reaction, see <i>Year-Book of Pharmacy</i> , 1878, p. 578.	The liquids form a homogeneous mixture.	The liquids form a homogeneous mixture.

From the above table it appears that while shale naphtha presents the closest resemblance to petroleum spirit as regards its specific

gravity, boiling point, and solvent action on pitch, it is sharply distinguished from it by its behaviour with carbolic acid, in which respect it resembles coal-tar naphtha or benzol. The carbolic acid test is not available for examining a mixture of petroleum with shale or coal-tar naphtha, as in such cases the phenol passes readily into complete solution.

In its limited solubility in spirit of wine, shale naphtha behaves like petroleum spirit, and differs from benzol.

As the carbolic acid had shown a sharp distinction between the more volatile products from petroleum and those from bituminous shale, it appeared interesting to compare the reactions yielded by burning oils from different sources. The samples of burning oil compared with a specimen of refined American petroleum, or "kerosene," of '800 specific gravity, boiling at 166° C., and one of shale oil, or "photogene," of '801 specific gravity, boiling at 170° C. Both samples required sixteen or seventeen volumes of methylated spirit for complete solution, and gave with coal-tar pitch light yellow liquids having a greenish fluorescence.

Carbolic acid, employed in the proportion indicated above, was found not be miscible with either kind of burning oil, but the petroleum product caused it gradually to assume a dark purple and ultimately a black colour. This reaction was repeatedly obtained, but I am unable to say whether it is peculiar to the few specimens hitherto examined, or whether it is a test which might be generally applied to distinguish petroleum kerosene from the similar product from shale.

I produce tubes showing the reactions with pitch and carbolic acid yielded by petroleum spirit and burning oil, shale naphtha and burning oil, and coal-tar benzene.

In my previous paper I described a method of applying nitric acid to the discrimination of petroleum spirit and benzol in such a manner as to allow of rough quantitative results being obtained. I may say, however, that my observation that the volume of petroleum spirit remains unchanged when treated with nitric acid under the conditions prescribed in my former paper, is not true of all samples. Some specimens of petroleum spirit lose 10 or 12 per cent. by measure when treated with nitric acid, and the portion which apparently remains unaltered contains a sensible proportion of nitro-compounds.

Correspondence with a friend engaged in the distillation of shale, and who desires to remain anonymous, has given me a further insight into the constitution of petroleum spirit, and the action of

nitric acid upon it. I have therefore continued my experiments in this direction, and extended them to shale naphtha and the burning oils from shale and petroleum. My researches are still too incomplete for detailed publication, but I believe I have definitely verified the following facts, some of which were pointed out to me by the correspondent already mentioned.

While petroleum spirit is but little affected by the action, for a few minutes, of 4 volumes of fuming nitric acid of 1.45 sp. gr., shale naphtha is violently attacked with considerable rise of temperature. After the completion of the reaction, two distinct layers of liquid are found floating on the acid. In one of the most reliable experiments, these layers measured 20 per cent. and 31 per cent. (by volume) respectively of the original shale naphtha taken. The layers were then separately treated with concentrated sulphuric acid, first of the ordinary strength, and then fuming. The lower of the two layers was by this means almost totally dissolved and got rid of, while the lighter layer still measured 14 per cent. of the original naphtha. Petroleum spirit, treated in a similar manner, never yields a second layer of oil floating on the acid, and after treatment with sulphuric acid and soda the residual oil still measures at least 75 per cent. of the original quantity operated on, and appears to consist of the true paraffins ($C_n H_{2n+2}$) of the petroleum spirit.

As to the nature of the liquid which disappears on successive treatment with nitric acid and ordinary fuming sulphuric acid, it appears certain that it consists essentially of hydrocarbons of the olefine series, having the general formula $C_n H_{2n}$. This conclusion is borne out by the fact that those products which are most readily acted on by nitric acid, also have the greatest capacity for decolorizing bromine water, and I am attempting to base a method of determining the olefines on this principle. The results already obtained in this manner are very remarkable, and conclusively prove the predominance of olefines in shale products, these readily decolorizing many times the volume of bromine which can be caused to combine with petroleum naphtha or burning oil.

In petroleum spirit I have repeatedly found traces of benzene and its homologues, as indicated by the production of aniline. Shale products, however, appear to be wholly destitute of this series of hydrocarbons. I am informed that while chrysene is produced largely by the distillation of shale, anthracene is met with in but very insignificant quantity, and naphthalene appears to be entirely absent. The lubricating oils produced from shale consist almost wholly of

olefines, the paraffins of high boiling point being solid at ordinary temperatures, and hence are separated in the form of paraffin wax.

The following table shows roughly the differences existing in chemical constitution between petroleum products and the bodies of similar physical characters obtained by the distillation of shale:—

	Petroleum.	Shale.
Naphtha	At least 75 per cent. of heptane, C_7H_{16} , and other hydrocarbons of the marsh gas or paraffin series, C_nH_{2n+2} . The remainder apparently olefines, C_nH_{2n} , with distinct traces of benzene, C_6H_6 , and its homologues.	At least 60 or 70 per cent. of heptylene, C_7H_{14} , and other hydrocarbons of the olefiant gas or ethylene series, C_nH_{2n} . The remainder paraffins, C_nH_{2n} . No trace of benzene or its homologues.
Photogene or burning oil.	55 to 80 per cent. of higher members of paraffin series, C_nH_{2n+2} . The remainder chiefly olefines.	60 to 65 per cent. of higher members of olefine series C_nH_{2n} . The remainder paraffins, C_nH_{2n+2} .
Lubricating Oil . .	(?)	Almost wholly higher olefines, the paraffins of similar high boiling point being solid. No naphthalene.
Wax.	Solid paraffins C_nH_{2n+2}	Solid paraffins, C_nH_{2n+2} .

From these, and many other observations, it is clear that the naphthas from petroleum and shale are not chemically identical. It is probable that while petroleum spirit consists chiefly of heptane, C_7H_{16} , and other members of the marsh gas or paraffin series of hydrocarbons, shale naphtha contains a very large proportion of hydrocarbons of the olefine or ethylene series, heptylene, C_7H_{14} , being one of the leading constituents.

The burning oil from shale, when treated similarly with nitric acid, gives no second layer of oil, the only layer measuring some 86 to 90 per cent. of the original sample. On treating this with sulphuric acid, great heat is developed, and the residual oil, after washing with alkali, etc., measures pretty constantly 35 to 37 per cent. of that originally operated on. This is a much smaller proportion than is left by petroleum burning oil when similarly treated. In fact, the process may be employed for discriminating between petroleum and shale photogenes.

The oily layer which survives the successive treatment with fuming nitric acid of 1.45 specific gravity, ordinary sulphuric acid (1.85 specific gravity), fuming sulphuric acid, and soda may be safely con-

sidered to consist of members of the paraffin series, having the general formula $C_n H_{2n+2}$.

I have to thank Mr. W. L. Gunn for his assistance in carrying out many of the experiments made in connection with the research.

Professor ATTFIELD asked if Mr. Allen thought there was any good chance of his reagent enabling petroleum oils and shale oils to be separated from one another when they were mixed. Not that they were very likely to be mixed, perhaps, but one knew that when some things got cheaper than others, mixtures were the result. With regard to the name photogene, which Mr. Allen thought should be applied, it was a good name, no doubt, and well expressed the article and its use, but he questioned whether those who made or used this oil would adopt it. For it was the one originally used some twenty-five years ago by those who worked on the subject, and if it was not adopted then, being the first name almost that was employed, it was not likely to be adopted now. He himself advocated it fifteen years ago, but without the slightest effect. He hoped Mr. Allen would work out further the reaction with carbolic acid.

Mr. REYNOLDS said Mr. Allen spoke of using No. 2 Calvert's carbolic acid. He should like to know whether he thought absolute phenol would be a suitable thing.

Dr. PAUL said Mr. Allen's idea with regard to the name was, he feared, not a practical one, as manufacturers were very fond of names chosen by themselves.

Mr. WHITE (Carmarthen) said there was no doubt a considerable difference in these oils. The coal-tar naphtha was the only one which would properly dissolve india-rubber or gutta-percha. Petroleum spirit left a greasy stain.

Mr. ALLEN said with reference to the possibility of separating these oils if they were mixed, it must be remembered that they were mixtures to begin with. If he were asked if he could separate petroleum spirit from shale spirit or shale naphtha, he could only say they were very much alike, except that one contained an excess of one constituent, and the other more of another. But if he were asked if he could separate paraffins and olefines, he said yes; he could obtain the paraffins separate, but he was not sure he could obtain the olefines. The method he had described, the action of nitric acid, destroyed the olefines but left the paraffins intact. He saw no chance of obtaining a separation of the two naphthas from petroleum and shale, nor did he think it possible to detect the admixture of

one with the other unless the proportion of each was considerable. But he had shown that the products from the two sources could be readily discriminated when separate. As a matter of fact, commercially the price of the shale burning oil and shale naphtha was regulated by the price of petroleum, and when the latter went up so did the shale products. Shale naphtha was largely used as a substitute for turpentine. It was said that petroleum spirit left a nasty greasy mark, but that must be because it was badly prepared. Manufacturers wanted to have a market for everything, and what would not go into the burning oils passed as naphtha. And since burning oil had to have a high boiling point and a high flashing point, no doubt a good deal went into the naphtha which had better be left out. If it were redistilled and the last portions rejected, a perfectly volatile petroleum spirit would be obtained, which would leave no trace of any stain. He had been asked whether he knew the action on petroleum spirit of absolute phenol as distinguished from Calvert's No. 2 carbolic acid, but the two were the same thing. Nos. 1 and 2 carbolic acid presented no difference, except that one was intended for internal use. As he understood, the main difference was that it was put in smaller bottles and sold at a higher price. Anhydrous phenol, or anhydrous carbolic acid, was in the form of crystals, which when pure, as he pointed out to the Conference two years since, boiled at 182° and melted at 41° C. If a little water were added to it the melting point was greatly lowered. He mentioned that it was necessary to use anhydrous phenol for the test, and the sample must be melted and boiled in order to drive off any water. The liquid form of carbolic acid should not be used, because that consisted chiefly of cresylic acid, which was miscible with petroleum naphtha at all temperatures.

A vote of thanks was passed to Mr. Allen for his paper.

The next paper read was on—

A SAMPLE OF CAYENNE.

By THOMAS GREENISH, F.C.S.

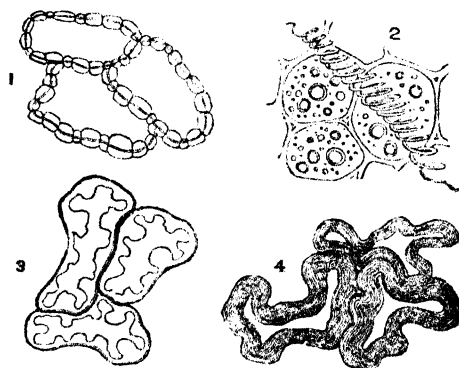
A short time since a sample of cayenne was placed in my hands by Mr. Holmes, with a request that I would submit it to microscopical examination. It had been sent to him as an article which had recently made its appearance in commerce.

The sample possessed all the external characters of the true

cayenne, and such a one as is grown in Natal, ground in the colony, and sent in that state to this country. It had an oily appearance which seemed artificial, and communicated to the paper in which it was folded, together with the oil, a reddish colour; the oil which permeated the paper was a fixed oil.

There are two distinct cayennes grown in Natal: one is a brilliant red, and the other yellowish and corresponding to the Nepaul pepper; they are both, and more especially the former, extremely pungent. This sample, however, although possessing, to the naked eye, all the external characters of the Natal red pepper, was entirely devoid of pungency.

At first it was thought probable that some other pod than that of the capsicum had been ground and forwarded to this country for the purpose of adulterating the genuine article; to determine this point with certainty, a portion of it was subjected to careful histological examination, and the cellular structure compared with that of true Natal samples which I had previously examined.



CHARACTERISTIC CELLS OF THE CAPSICUM FRUIT.

The annexed drawing shows the characteristic cells of the capsicum fruit, isolated, and mounted separately for the purpose of reference on such an occasion as the present, where they were required, for comparison with those of the sample. The cells, fig. 1, are the external cells of the capsicum pod; usually they possess more or less of a beaded appearance, as represented in the drawing. Within them are parenchymatous cells, fig. 2, traversed by spiral vessels. The surface of the internal coat is covered by the cells, fig. 3. The irregularities seen on the internal surface of

individual cells, and so conspicuous in figs. 1 and 3, as compared with the parenchymatous cells (fig. 2), are caused by the irregular deposition of the secondary matter, assuming very different and interesting forms, a circumstance frequently observed in histological investigation.

With the pod must necessarily be ground the seed which it contains, and hence is met with in an examination of the powder a remarkably characteristic cell, serpentine in form and with its secondary deposit in regular laminæ (fig. 4), which are rendered conspicuous by the appropriate reagents.

Having given considerable attention to the anatomical examinations of different capsicums, without meeting with one that was not more or less pungent, the question arose, How has this sample been deprived of its pungency, so as still to retain its colour?

In the first place, heat was employed to drive off the acrid principles of the capsicum, but this was not successful; decomposition occurred just when volatilization was taking place; this may possibly have been due to the fact that the pungent principle resides in a resin as well as a volatile oil. Diluted spirit was then tried, and by this agent the acrid matter was removed without, or with very little, loss of colour, leaving a marc devoid of pungency, and possessing much the appearance of the sample in question.

From subsequent information it is believed that the more brilliant samples of cayenne, but deprived of pungency, or perhaps a bye-product of some manufacture, are used for giving the special plumage to canaries, and that the sample in question was most probably one intended for this purpose, and not an adulterant of commercial cayenne.

The investigation of this subject has afforded me the opportunity of describing the structural details of the capsicum fruit, and will probably be accepted as another illustration of the value of histological investigation in determining, by anatomical detail, the true from the false in materia medica specimens or any product of the vegetable kingdom which may be submitted to the pharmacist.

The PRESIDENT said this paper had both practical and scientific value. He should like to ask Mr. Greenish what he considered the very brilliant colour in the first sample was due to, whether there had been any fixed oil added which drew out the colour.

Mr. BRADY said there was a red pepper commonly used in some parts of southern Europe, notably in Hungary, very similar in colour and appearance with the sample produced. He had seen it

brought into the market at Pesth in large quantities in linen bags. He believed it was the produce of a capsicum, although he had never traced the species; but it had so little strength that it might be used a teaspoonful at a time, as a condiment. A very similar pepper was used in Algeria.

Mr. NAYLOR said he had met with a sample of cayenne pepper very closely resembling the one handed round, but it possessed a much more pungent taste. It was forwarded with a request to obtain a quantity of it; but though it was sent to the wholesale houses and no opportunity missed, he was unable to get a further supply, and he had not to this day been able to make out what pepper it really was.

Mr. CHIPPERFIELD asked what was cayenne pepper? He took it that it was capsicum ground before it was dried, and it must also have some salt mixed with it, or else it would not keep good for any length of time. For instance, they all knew practically that *pulv. capsici* did not keep very long, and those who were not frequently in the habit of using it, when they want to make up a prescription often found it was mouldy and bad. He therefore took it that it was owing to the salt being added to the capsicum or chilli that the pepper would keep so long. They always found cayenne pepper red, but Nepaul pepper was not so deep a colour, being almost yellow. Chillies themselves were of all colours—green, a beautiful red, and sometimes a beautiful yellow, but they never found pepper made either from the green or from the yellow ones. He often had them himself in the form of West or East Indian pickles with all these beautiful colours.

Mr. ANDREWS asked if it were not possible that this pepper might have been used for the preparation of soluble cayenne pepper; whether, by means of spirit the active pungent matter had been extracted and the residue treated in some way, as he suggested, with fixed oil. He could not account for it otherwise, for there was no trace of pungency.

Mr. CHIPPERFIELD said he doubted if birds would care to eat the chillies after all the pungency had been taken from them.

Mr. COTTRELL said he had a sample of cayenne pepper on one occasion two or three months, and there was a little suspicion of its having got damp; it had the flavour of the sample now produced, but although the pungency was gone, it tasted of saffron and had the colour of saffron.

Mr. LLOYD said the flavour appeared to him to be that of palm oil.

Mr. GERRARD said that during the past year he had prepared a quantity of extract of capsicum which had been applied locally for therapeutical purposes in treating skin disease, and probably in a short time a paper would appear on the subject in one of the medical journals. He found that the yield was very variable. The extract was prepared by exhaustion with methylated spirit and distilling off the alcohol, when the residual extract separated into two layers, one which was evidently resinous and the other fatty. This fatty layer would crystallize, and as such a mixture was not well adapted for mixing with fats as an ointment, it was necessary to add a little alcohol to cause a proper admixture of the resin and the fat. The yield of resinous matter from capsicum varied considerably, for he obtained 50 per cent. more resin from some samples than from others. In some the fatty matter was in excess, and in others the resinous matter. Until recently he had always understood that capsicum, if applied locally, would not produce a blister, and he believed Mr. Greenish himself held that opinion two or three years ago; but he had since found out the contrary, for if some of this fatty matter got on the skin it would produce intense irritation, and if it remained long enough it would raise a blister.

Dr. SYMES presumed that Mr. Greenish scarcely considered this to be a sample of Natal cayenne. He thought it had very little of the characteristics of that article. The Natal cayenne was an article of commerce fetching rather a high price, and was in demand amongst grocers. It might have been a special sample of Natal cayenne that Mr. Naylor was seeking on that occasion he referred to. It had a peculiar odour, and a very oily appearance. It was scarcely necessary that chemists should dispense cayenne pepper containing salt, because if the capsicums were carefully dried and powdered, he never found them spoil.

Mr. CLARK said to the best of his belief capsicum pepper was not sent out mixed with salt, and as there might be public analysts in the room it might be as well to state that fact.

Mr. UMNEY said those interested in the chemistry of chillies could not do better than peruse a valuable paper by Mr. Thresh, which they had placed before them some time ago, showing there was a large quantity of fixed oil in the ordinary chillies of trade; it was owing to this fact that they saw the oily stain on the paper, Every one who had handled a parcel of cayenne must have made this observation.

Mr. GREENISH said it was a curious fact, but this appeared to be

used for the plumage of canaries; whereas the principal importer in London of Natal cayenne, who prided himself on its colour and pungency, told him over and over again that bird fanciers especially asked for it. But here was a fact, that bird fanciers wanted that which was pungent, and there was this which was without any pungency was used for the same purposes. He was pleased to hear from Mr. Brady that there was a Hungarian cayenne which had very little taste indeed, but this had seemingly no taste at all. Mr. Andrews had suggested that it might be a bye-product in making a soluble cayenne. He had alluded to that in the paper, but did not wish to say it had been used for that purpose. Mr. Gerrard seemed to have misunderstood him when he spoke of cayenne in a mustard plaster. What he said was that he had examined two or three samples of mustard leaf, and amongst them was an American sample, in which there was no capsicum, but he did not express any opinion about the properties of capsicum to raise a blister or otherwise.

A vote of thanks was passed to Mr. Greenish for his paper.

THE INTERNATIONAL PHARMACEUTICAL CONGRESS.

The PRESIDENT said that the time for the mid-day adjournment had arrived, but, before they separated, he believed Mr. Greenish wished to say a word or two about the International Pharmaceutical Congress, which was to be held in England next year. The delegates to Vienna and St. Petersburg were very well received, and they should all do something on their part to return the compliment. What was suggested was small subscriptions but numerous ones.

Mr. GREENISH said no doubt most of the gentlemen present were interested in this subject; in fact their very presence there showed their interest in pharmacy, and they would be aware that it was proposed to hold an International Medical Congress in 1881 in London, and he believed from the active steps now being taken that that congress would be a very great success. About six years ago he was appointed a delegate to the International Pharmaceutical Congress in St. Petersburg, when he gave the delegates there an invitation to meet next in London. Five years was the usual interval between the meetings, but the war between Russia and Turkey, and various other things, rendered it inadvisable to meet at the usual time in London, and therefore it was postponed. But they now thought it very desirable that in 1881 this International

Pharmaceutical Congress should be held in London. Its first meeting was in Brunswick many years ago, the second in Paris, the third in Vienna, and the fourth in St. Petersburg; and it was with considerable delight, more than he could express, that those who were present at St. Petersburg received the invitation which was again sent from the Pharmaceutical Society on the return of the delegates. Many points of interest would come before this International Congress, one being that much misunderstood question, the International Pharmacopœia. In Germany there were he did not know how many pharmacopœias at one time, but now there was only one; in Switzerland there were a large number, but now there was only one; and therefore he did not think there would be much difficulty in forming such an International Pharmacopœia as was shadowed forth at St. Petersburg, namely, one in which the active preparation of opium, strychnine, and such substances should be the same in the several countries. In this question some of the pharmacists and medical men abroad took much more interest than even the pharmacists of this country; and the presence of those medical men and pharmacists in England at that particular time, and the discussions probably that would take place, would, he hoped, tend to impress on the Medical Council how very desirable it was for pharmacy to have a certain number of chosen pharmacists take part in the preparation of the Pharmacopœia.

The conference then adjourned for luncheon.

Upon reassembling, the first paper read was—

NOTES UPON THE GREEN EXTRACTS OF THE PHARMACOPŒIA.

By W. A. H. NAYLOR, F.C.S.

The first official announcement of the use of preparations made from green plants which the most nearly resemble our extracts, dates as far back as 1746, when the leaves of rue and savin were made to yield a semi-solid product by the successive operations of decoction, filtration, and evaporation. Twenty years later produced the veritable prototype of our green extract in the umbelliferous plant, the hemlock, under the designation of inspissated juice, and it was ordered to be prepared by taking the whole plant, bruising it, expressing the juice and evaporating it with care. The lapse of

another twenty years sufficed to bestow upon the inspissated juice of the hemlock and other products similarly prepared the generic appellation by which they continue to be known, that of extracts. And when it is remembered how important a position this class of preparations occupies in the domain of therapeutics, and how the remedial value of the extracts may be affected by variations in their mode of production, it is not surprising that so much attention should have been devoted to the subject of their manufacture. To record such observations in regard to the manufacture of the green extracts as have been furnished by the experiences of a laboratory constitutes the design of this paper. Belladonna may be taken in illustration of the following remarks:—

The plant having been obtained, no time should be lost in working it; but while in the fresh condition it should be stripped of its leaves and flowering tops. Prompt attention to what may seem so trifling a circumstance is, however, of the first importance, for the perfection of the product will greatly depend upon the degree to which fermentation has been prevented, or if induced, the degree to which it has been checked. If several plants have been tied in a bundle, as is generally the case, and the several bundles be crowded together, it is obvious that under such conditions they will soon become heated and ferment. It will be wise, therefore, to untie any bundles and apportion so much room to the several plants, so that at least they may not be more than in loose contact. Should it happen that the plants come to hand so late in the day as to render inevitable the postponement of operations until the next morning, their stems may with advantage be put into a little water for the night. It will be remembered that the Pharmacopœia directs that the flowering tops as well as the leaves of the several plants be employed for making their respective extracts, while the old London Pharmacopœia restricts the use of parts to the leaves alone. The main advantage secured by this addition was the production of an extract which was less prone to change. At the same time there was obtained an increased yield of extract of not inferior quality. The suggestion that flowering tops should be employed was due to Mr. Squire. By experiment it was found that the product obtained from the combined use of leaves, flowers, and their peduncles was less liable to undergo change, and present that unsightly appearance known as mould, a condition which the leaf extract could rarely be held guiltless of assuming.

In a paper read at an evening meeting of the Pharmaceutical Society now nearly twenty years ago, Mr. Squire discussed the

question, "Whether medicinal extracts from green herbs are best prepared from leaves only, or from all the soft parts of the plant taken together." From the same plant, belladonna, the author prepared two extracts, the one being the product of the leaves alone, the other the combined product of the young stalks and flowers. The leaf extract became mouldy in ten days, the other remained unimpaired. These experiments of Mr. Squire were confirmed by others who had had large experience of these particular preparations. And to-day it is a matter of common knowledge amongst experienced manufacturers of medicinal extracts, that when these preparations are made with the leaves only, they invariably become mouldy, "whereas when made with the soft parts of the whole plant, they keep perfectly well and remain of a good consistence from one season to another."

If it be asked to what proximate principle may be assigned the preservative properties apparently resident in the peduncle or young stems, one has little hesitation in affirming it to be due mainly to the gummy matter invariably present in these parts of the plant. In addition to gummy matter, however, there exists in the young stems inorganic salts, which are known to exercise an antiseptic influence over putrescible substances, and I would suggest whether the keeping properties of an extract in which the young stems have been employed may not be in part attributable to mixed chlorides of sodium and potassium. Here I would remark that the addition of but a very small proportion of gum to an extract—while in the fresh condition and which is known readily to mould—will materially retard the period of decay. This fact is mentioned because it harmonizes with the opinion just expressed; but it must not be supposed that I recommend such an addition in making the Pharmacopœia extracts,—an addition, moreover, for which there should be no necessity.

The next part of the process consists in bruising the plucked "leaves and flowering tops." This operation, in kind, is one so well known to the practised pharmacist as in general terms to require no comment. On the small scale this object will be best accomplished by vigorously beating the selected parts in a bell-metal mortar, or a stone mortar, as recommended officially. If the stouter stems have been rejected, little difficulty will be experienced in effecting a fairly successful destruction of the texture of the leaves, etc. This operation is more easily and efficiently performed by stone runners, as in a grinding mill, where direct pressure and a tearing action are simultaneously brought into play.

In this manner the bruising operation is conducted by wholesale manufacturers.

When the leaves, etc., have been disintegrated to the necessary degree, they should be enclosed in a hair cloth, and submitted to pressure. For this purpose a good press is essential. But while much depends upon the power of the press, much also depends upon the mode in which pressure is applied. For instance, if young stalks have been imperfectly comminuted, the disintegrated mass under the influence of pressure will spring, the several particles will not be acted upon equally; as a result, little spaces will form here and there throughout the mass, and so render extremely difficult the successful extraction of the juice. Under such circumstances, a powerful press would in great measure compensate for the low results obtained by a smaller one. If, however, the leaf texture has been uniformly and completely broken up, as it would be under stone runners, the pressure will be equal throughout the mass, and no spaces will be formed. In this case the pressure should at first be applied very gradually, and increased as the proportion of juice in the mass decreases. By thus graduating the force as it is applied, the marc is prevented from being forced through its cloth, and the maximum amount of juice is obtained. A hydraulic press is the one generally employed for this and similar purposes on the large scale. It is, I suppose, hardly necessary to remark that caution is required in the pressure of such a plant as belladonna, otherwise a little of the juice is apt to be squirted into the eye, a circumstance which might be attended with more than temporary inconvenience. Before passing from this part of the process, I desire to record one or two observations upon the juice itself. And I would note that from the general appearance of the juice the practised eye can presage the quality and to some extent the yield of the final product. Neither the watery juice of a bright green colour, nor the deeply brown in which the chlorophyll readily subsides, will produce an extract of good quality. The reason of this is to be found in the fact that these characters belong respectively to plants which have not arrived at maturity and those which have advanced beyond this stage. That juice which is intermediate in quality between these two, where the bright green of the one by blending with the other is tempered into a dull green, will invariably yield a product possessing in the highest degree the characters of a good extract. The specific gravity of belladonna juice ranges from 1015 to 1035, the average may be taken at 1020, and in an ordinary season, a ton of leaves and young stems would give 130 gallons of juice. These

numbers must be regarded as approximate only, since the juice of plants, and consequently the extracts made therefrom, are greatly influenced by variations of seasons.

I now come to speak of that part of the process which directs the strained liquor to be heated to 130° F., and the chlorophyll which separates to be removed by filtration through calico. The strained liquor is then to be heated to 200° F. to coagulate the albumen, and again filtered. Regarding both these operations, they are in themselves simple and similar, and require no comment. I would merely add that it will be found of great advantage to remove the scum which rises to the surface during the heating of the liquor to the temperature at which the chlorophyll separates out. With reference to the rejection of the albumen, I would make the following observations :—

First. That vegetable albumen in an uncoagulated or imperfectly coagulated condition is much more active in promoting decomposition than when coagulation has been completely effected. Therefore that system of making extracts in which the juice is at once evaporated at a temperature too low to ensure complete coagulation of the albumen appears to me an objectionable one.

Secondly. There is a tendency for some portion of the vegetable albumen to be thrown out of solution when the temperature has reached 130° F., *i.e.*, when the chlorophyll separates. This tendency towards separation at low temperatures appears to be less as the percentage of alkaline chlorides is great, a fact which possibly accounts in some measure for the moulding of extracts when made from the juice of the leaves alone. For the leaves contain more albumen and chlorophyll than any other part of the plant, and proportionately less chlorides; and in my experience, I have found that some portion of the albumen which is removed along with the chlorophyll is subsequently returned in company with the green colouring matter.

Thirdly. For all practical purposes the albumen may be completely thrown out of solution by raising the juice to the boiling temperature. This, of course, necessitates the simultaneous removal of the chlorophyll.

Lastly. So far as the keeping properties of the extract are concerned, they are not interfered with to a perceptible extent from one season to another by the retention of coagulated albumen, provided the juice of the young stalks of the stem has contributed to the final product.

Some of the objections which have been raised against the

retention of the albumen are to the effect that being an inert substance it dilutes the extract, increases the yield, and adds to the remuneration of the manufacturer. In reply to these objections it may be stated that as far as is known there is no conclusive evidence to show that the albumen, even in the condition in which it would exist in the green extracts, is devoid of physiological action, or, supposing it to possess no specific remedial properties, may it not be one of those substances which exercises a modifying or controlling influence, so that in rejecting what seems superfluous we may be losing a valuable ingredient? The increase of yield to the extract by the incorporation of the albumen would be in the ratio of about 1 oz. of moist albumen to the pound of finished product. One is therefore led to conclude that so comparatively insignificant an increase of remuneration to the manufacturer is quite inadequate to account for the reasons which, under certain circumstances, induced him to retain this ingredient.

An argument which has been adduced in favour of retaining the albumen is based upon the disturbing influence which its withdrawal occasions, causing the nicely balanced affinities by which the several constituents of the plant are held together to be thrown out of equilibrium. Without doubt there is some force in this argument, but it loses much of its weight when it is remembered that those who advance it are themselves also in favour of coagulating, removing, though subsequently returning, the albumen. With the main drift of this argument I cordially agree, and could refer to modes of treatment in relation to certain drugs in which its facts are borne out by the experiences of medical men; but its application in this particular instance seems to me less warrantable.

I have now to remark upon the last part of the process, which directs the strained liquor from which the albumen and chlorophyll has been removed to be evaporated by a *water-bath* to the consistence of a thin syrup, the green colouring matter is then to be added, the whole assiduously stirred, and evaporation continued at a temperature not exceeding 140° F. until the extract is of a suitable consistence for forming pills. It will be noted that in these directions there is no mention of the kind of apparatus to be employed for the evaporation of the liquid. It may be presumed therefore that a wide shallow vessel, such as is ordinarily used for purposes of this description, was intended by the compilers of the process. In the absence, too, of any particulars respecting the manner in which evaporation is to be conducted, we may safely infer that up to a given point no other precaution is necessary than that the substance

to be heated be subjected to a temperature near to, not necessarily below, but not exceeding, 212° F. Now I am well aware that in conducting so ordinary an operation in so simple a manner and with such apparatus as is to be found in every well appointed pharmacy, the fullest opportunity and advantage is secured to the pharmacist for making his own extract. I am also willing to admit that not a few of the objections urged against evaporation by exposure to air assisted by heat, have not as yet been substantiated by proofs of a convincing character. Without, however, recounting these objections, I will at once declare myself in favour of what is termed evaporation *in vacuo*, and for the following reasons:—

First. When the liquor of an extract is evaporated at a temperature little exceeding 212° F., with a current of air over its surface into which the vapour diffuses, after the liquor has attained a certain degree of concentration it will be noted that the resinous and gummy bodies have undergone a change, probably from the absorption of oxygen from the air. And this change will be indicated by the opalescent appearance of the liquor, to be succeeded by a deposition of matter which in no subsequent part of the process will again pass into solution. This tendency to premature and distinct separation during concentration is largely decreased if not entirely prevented by evaporation *in vacuo*. Whether the change referred to impairs the medicinal quality of the extract I am quite unable to say.

Secondly. By resorting to a temperature at which evaporation would be conducted in a vacuum pan, we are the better able to retain the volatile constituents of the plant, a fact the importance of which cannot fail to be appreciated when it is remembered that the activity of one official green extract is due to a volatile alkaloid. And here I would remark that those who have given any attention to the evaporation of the hemlock juice have recommended its exposure in thin layers to a continuous current of dry air. I confess I should like to see some such modification adopted by the compilers of the next Pharmacopœia, at least so far as hemlock extract is concerned.

Thirdly. The most potent argument to be advanced in favour of evaporation *in vacuo* is based upon the observation that one or more soluble constituents of certain plants present a marked difference in their taste according to the manner in which evaporation has been conducted. I would note especially the extract of taraxacum. This extract when made as the Pharmacopœia directs, by evaporating the strained juice over a water-bath, has a sickly sweetish taste, whereas, when evaporated *in vacuo* it is found to have retained,

apparently unimpaired, its bitter properties. This argument in its application to dandelion extract is overruled by those manufacturers who contend that the evaporation of the juice in open pans at low temperatures produces no such conversion of bitter principle into sweet, *provided* the root be gathered not earlier than February. But since the prevailing opinion amongst pharmacists is in favour of collecting the root before it is attacked by frost, and hence, of necessity, usually before February, it follows that with the majority this objection can have no weight in invalidating the argument. I may say that evaporation in a vacuum pan is carried on at a temperature of about 115° F., and if the piston of the air pump has been well packed, it may fall to between 90 to 100° F.

The rate at which fluids evaporate in the vacuum pan varies greatly with the nature of the liquid operated upon. The juices of plants are amongst the slowest and the most capricious, owing to the propensity they manifest for frothing, a condition which most prevails at the commencement of the evaporation and greatly retards its progress. It is therefore somewhat difficult to fix definitely the rate of evaporation, but we may regard four gallons per hour, in the case of belladonna juice with a vacuum pan, comfortably working twelve gallons at a time, as a close approximation to fact.

In recommending the addition of the chlorophyll to the liquor when it has reached that degree of concentration represented by a *thin syrup*, it may be presumed the object aimed at was the perfect incorporation of the green colouring matter with the other constituents of the extract, and that, too, in as little altered a condition as circumstances could command. I think this object is the better attained by evaporating the liquor to a *thick syrup*, a consistence it would have on leaving the vacuum pan, and then stirring in the chlorophyll, it having been previously passed through a moderately fine hair sieve. This modification obviates the necessity of heating the extract over a water-bath at a temperature at which evaporation proceeds at a very slow rate, and at a time when the extract is gradually acquiring a consistence in which it will more readily retain its heat, and will in consequence be more likely to be acted upon injuriously. In addition to improving the appearance of the extract, the retention of the green colouring matter possesses the advantage of preventing the extract from absorbing moisture and becoming inconveniently soft. Regarding the term *pilular consistence* as defining the degree of concentration of the final product, it appears to me sufficiently explicit, and I take it to mean that the extract so far as possible may unite the properties of plasticity and

firmness to such a degree as that it can be moulded without adhering to the fingers, and when divided will retain its globular shape. The yield of extract from the belladonna plant varies within wide limits, and is greatly influenced by seasons, but we may regard 80 to 90 pounds per ton as an average result.

Mr. PLOWMAN said he had had very little experience in making green extracts, and, therefore, was not in a position to criticise the paper, but he would like to ask a question or two. He had been struck with the very practical nature of the paper, and one thing which seemed more particularly to affect the final character of the product was rubbing the chlorophyll through a moderately fine hair sieve. If that was not done the chlorophyll got into little pellets, and it was almost impossible to get a smooth final product. It was stated that gummy matter materially retarded the extract turning mouldy, and he should like to know whether gum was actually added in practice. The next point was that the albumen had a tendency to come out with the chlorophyll at 130°, or before. He should be glad to know if Mr. Naylor had actually instituted any experiments to prove the existence or non-existence of albumen in the chlorophyll which first separated at that temperature. It seemed somewhat doubtful whether the presence or absence of albumen modified the action of the extract. He should like to know if when the albumen separated, any experiments had been made to determine whether any alkaloid or active principle adhered to the albumen, either when it was washed or when it was not washed. Probably there would be something adhering to it if not washed, but after washing he should venture to predict that the albumen would not contain anything active.

Mr. HUGHES was much pleased at the suggestion made in this able paper that extracts should be made of such a consistency that they could be easily dispensed in pills. A great difficulty he had was that the extracts he got from wholesale houses were so thin that it was necessary to add gum arabic or magnesia, which gave a pill greater in size than that intended by the prescriber. He hoped that wholesale houses would bear that in mind, and not send out extracts which would increase the size of the pill.

Mr. PLOWMAN thought 1 ounce of moist albumen to 1 pound of finished extract was a very material addition, being over 6 per cent., and would leave a large extra margin of profit.

Mr. GREENISH was very glad to hear Mr. Naylor pay a well deserved compliment in the early part of his paper to a man they all

respected, Mr. Squire. It really was Mr. Squire who taught the pharmacists of Great Britain the value of an extract, and how to make it properly. Mr. Naylor spoke of the gummy property as tending to keep the extract when the soft portions of the plant beyond the leaf were used. He would ask if it were not due to the fact that when using the leaf he had a much larger quantity of vegetable albumen, a product which ran more readily into decomposition, than he would have if he used the soft portions of the plant containing in fact the vascular bundles. He thought it was a mistake to use a hydraulic press; it might be necessary in commerce, but in so doing one was apt to press out not only the juice of the plant, but the smaller particles, which worked up into the extract. The juice by itself made a nice transparent extract, very hygroscopic, perhaps a little more difficult to manage, and the yield much smaller, but it seemed to him much more satisfactory.

Professor ATTFIELD said Mr. Naylor assigned to the inorganic chlorides an important function in the keeping of the extracts, and referred to chloride of sodium as well as chloride of potassium. He had examined very many organic residues of the combustion of extracts, and had almost always found chloride of potassium present to the exclusion of chloride of sodium. He should like to know how often chloride of sodium had been found, and in what quantity.

Mr. NAYLOR, in reply to Mr. Plowman, said there was some little difficulty in ascertaining whether gum had really been added to an extract, or whether the gummy matter, which was sometimes present in much larger quantities than in others, was a natural product. That albumen separated along with the chlorophyll could be shown by dissolving out the chlorophyll, and then using a suitable solvent for the albumen. Sometimes very little albumen went down with the chlorophyll, and at other times a fair quantity. It was not unreasonable to suppose that some albumen did separate at the temperature named, considering its extremely complex character. With reference to alkaloids being thrown down along with the albumen, his experiments on that point were not complete, and therefore he had not mentioned them; but as far as conium was concerned, he was unable to detect the presence of any alkaloid in the albumen when washed. He agreed with Mr. Greenish that the leaf contained more albumen and chlorophyll than any other part of the plant, but the fact that when gum was added to the leaf product it would keep it, and that gummy matter was contained in the stalks, gave reasonable ground to suppose that it exercised an antiseptic or, at any rate, conservative influence

over the extracts. With reference to hydraulic pressure sometimes squeezing out the cellular tissue, that of course would be removed when the extract was strained. Chlorine was generally present as chloride of potassium, and he had found only traces of chloride of sodium.

Mr. GREENISH said he recollected in the earlier days of the Pharmaceutical Society a suggestion being made at one of the evening meetings, that a small addition of gum arabic to an extract had a remarkably preservative property.

The PRESIDENT said he did not remember that, and was not aware that it had ever been suggested as an addition to green extracts.

A vote of thanks was then passed to Mr. Naylor for his paper.

The following two papers were then read :—

NOTE ON THE PRESENCE OF ARSENIC IN THE TINCTURE AND SOLUTION OF PERCHLORIDE OF IRON.

By F. W. FLETCHER, F.C.S.

The presence of arsenic as an impurity in many well known pharmaceutical preparations has formed the subject of numerous papers by various investigators. The evidence in the celebrated Smethurst trial seems to have first roused attention to its presence in subnitrate of bismuth.* Since then it has been noted by Reynolds in sulphide of antimony,† by Rademaker in phosphoric acid,‡ by Bussy in sulphate of potash,§ and by Giles and Randall || in Parrish's syrup. To this list I have the melancholy satisfaction of contributing an addition. Some time since, having occasion to examine a number of samples of hydrochloric acid, many of which had been sold as pure, and finding abundant indication of the presence of arsenic in all, it occurred to me that possibly a considerable portion of the liquor ferri perchloridi of pharmacy might be prepared with similar acid, and if so would doubtless contain arsenic. I therefore procured specimens both of the tincture and solution from five very eminent dispensing establishments, each of which when examined by Marsh's test yielded dense mirrors of arsenicum. Samples obtained from various other sources yielded like results. As it appeared that it would be a matter of interest to determine the actual amount of arsenicum present, the five samples of strong

* *Pharm. Journ.* [2], i., 356. † *Ibid.* [2], iii., 568.

‡ *Ibid.* [3], i., 426. § *Ibid.* [3], ii., 954. || *Ibid.* [3], iii., 437.

solution above referred to were examined quantitatively. To estimate the arsenic, a measured volume was diluted, reduced with sodium sulphite, saturated with H_2S , the filtered and washed precipitate dissolved in HNO_3 , and to the solution thus obtained an excess of ammonia and magnesia mixture added.

$\text{Mg}(\text{NH}_4\text{AsO}_4)_2 \cdot \text{H}_2\text{O}$.				As_2O_3 Grains per 100 fluid ounces.
1.	18 c.c. yielded	·009 gram.	equal to	10·85
2.	18 „ „	·010 „	„	12·07
3.	14 „ „	not weighable	„	—
4.	25 „ „	·015 gram.	„	13·05
5.	14 „ „	not weighable	„	—

Of several other specimens examined, one yielded no less than 33·8 grains As_2O_3 in 100 fluid ounces.

I venture no remark upon the therapeutical effect of such infinitesimal amounts of arsenic as would be contained in a single dose of the above liquors when administered in the form of the tincture or diluted solution, but, granting the result to be *nil*, the presence of an impurity of such ill fame can scarcely be considered desirable from a pharmaceutical point of view. Probably very few pharmacists are in the habit of making their own liq. ferri perchlor.; they cannot, therefore, be held directly responsible for a preparation for which they are dependent on outside sources. But, in concluding this brief note, I would offer one observation upon a question which seems to me worth consideration. Is there not a danger, in the midst of the present excessive production and competitive prices, of neglecting to keep up the standard of what may be called cheap medicines? It is well to remember that the pecuniary and the therapeutical value of a medicine very frequently stand in an inverse ratio. Whilst, therefore, the pharmacist does well to assure himself that his scammony, opium, and quinine are worth the money he pays for them, will he not be wise to spend an occasional half hour in inquiring into the character of more humble, but certainly not less deserving remedies?

THE GRAVIMETRIC ESTIMATION OF MINUTE QUANTITIES OF ARSENICUM BY AN INDIRECT METHOD.

By F. W. FLETCHER, F.C.S.

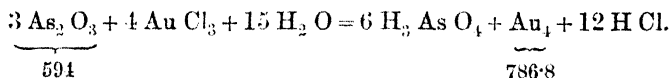
The method most generally employed for the determination of arsenicum is that of Levul, who was the first to propose its separ-

ation in the form of the double arseniate of ammonia and magnesia. This process, whilst undeniably the best of any of the direct gravimetric methods in use, cannot be said to be entirely satisfactory.

It is, in the first place, by no means an easy matter to isolate the arsenical salt, when present in complex solutions, associated with other bases and acids precipitable by magnesia mixture. It is, moreover, extremely difficult, if not impossible, to effectually wash the precipitate of ammonio-arsenate of magnesia; since, as Bunsen* and others have pointed out, it will retain sensible traces of salts present in the precipitating liquids as obstinately as sulphate of barium. There is also a danger of inaccurate results by reason of the variable nature of the precipitate when dried at slightly different temperatures. At 100° C. it is said to retain from 1 to 3 molecules of water, one only at 102–103° C., part of this equivalent being lost if the temperature is allowed to reach 105° C. Wittstein† proposed to overcome this objection by igniting the precipitate (preferably in a current of oxygen), and so converting it into arseniate of magnesia, but it has been observed by Rose‡ that the arsenic acid is liable to be reduced at high temperatures by the ammonia, a corresponding loss being necessarily incurred.

The chief drawback, however, in my own experience of the process is, that it fails to estimate the arsenicum when present in very minute quantity, and as every pharmacist is aware, cases occur in which the accurate determination of even traces of arsenic becomes a matter of considerable importance.

An ingenious method for the estimation of arsenicum when contained in a solution in the state of arsenious acid was proposed by Rose,§ based on the fact that when chloride of gold is added to a solution of arsenious acid, a precipitate of metallic gold is formed in accordance with the equation:—



And from the weight of the gold thus liberated a very accurate estimation of the amount of arsenic can be deduced. It is, however, necessary to let the mixture digest for some days to ensure complete decomposition, and like the magnesia process it is not applicable to the determination of very small amounts of arsenicum;

Liebig's Annalen, 192, iii. Also *Year-Book of Pharmacy*, 1879, 51.

† *Chemical Gazette*, vii., 242.

‡ *Ibid.*

§ *Ibid.*

inasmuch as the molecular weight of the precipitate is not very greatly in excess of that of the arsenious acid.

In a paper on the presence of arsenic in the subnitrate of bismuth, published some years since in the *Pharmaceutical Journal*,* Dr. Herapath described a method which he had successfully employed for the estimation of traces of arsenicum based on the well-known test of Marsh. His plan consisted in employing an exit tube of very hard glass, narrowed in several parts by being drawn out with the blowpipe, and bent into a triangular form. This, after being accurately weighed, was attached with an india-rubber joint to the chloride of calcium tube connected with the hydrogen bottle. The gas having been generated, heat was applied by separate spirit lamp flames to three or four portions of the bent tube. Upon introducing into the apparatus the liquid to be tested, any arseniuretted hydrogen evolved was of course decomposed in its passage through the tube, and at the arsenicum deposited. The increase in weight of the tube at the end of the operation represented the total arsenicum present in the substance under examination.

When the amount of arsenicum is weighable, Herapath's method leaves little to be desired, whilst it has the merit of yielding the substance sought for in a state of purity. When, however, the weight of the deposit falls below a milligram, trustworthy or concordant results can scarcely be expected.

Besides the various gravimetric processes referred to, there are, as is well known, several volumetric methods of estimating arsenicum. Of these, the older processes, based on the indirect oxidizing agency of iodine when that element is present in a solution containing arsenious acid, are only reliable when the amount of the latter is considerable. An important modification, rendering the volumetric method much more delicate, was proposed by W. A. H. Naylor, in an able paper on that subject, read at an evening meeting of the Pharmaceutical Society, in December last, and to those who prefer a volumetric method of analysis, Mr. Naylor's process may be used with advantage.

Whilst engaged in the examination of some solutions of perchloride of iron, referred to in a previous paper, and having only limited quantities of material to deal with, in some of which the amount of arsenicum was too small to estimate gravimetrically by existing methods, it occurred to me that the beautiful reaction first observed by Soubeiran as taking place when a stream of arseniuretted

* *Pharm. Journ.* [2], iv., 302.

hydrogen is passed through a solution of nitrate of silver, might possibly be made the basis of an accurate and rapid method for the indirect determination of minute quantities of arsenic. It will be remembered that the decomposition involved in the reaction is expressed by the following equation:—



From which it will be seen that for every 75 parts of arsenicum obtained in the state of As H_3 , no less than 648 parts of metallic silver are thrown out of solution. In other words, when the amount of arsenicum to be estimated does not amount to more than one-fifth of a milligram (or about three one-thousandths of a grain), the weight of the silver precipitate is so large as to be capable of accurate determination on any balance of average delicacy.

The method I have employed for the estimation is very simple. An ordinary flask of about 250 c.c. capacity, having an india-rubber stopper fitted with a thistle and a right angled delivery tube, and containing granules of pure zinc, serves for the hydrogen bottle. Attached to the exit by a short piece of flexible tubing is a 50 c.c. wide mouth bottle, containing about 30 c.c. $\frac{1}{10}$ N solution of lead acetate. In connection with this is another bottle of the same description, containing 30 c.c. of $\frac{1}{10}$ N solution of silver nitrate, and attached to this a third of precisely similar description; the delivery tube from the last terminating in the air. Pure hydrochloric acid having been poured into the flask, and the stream of hydrogen allowed to flow through the apparatus for some minutes—at the expiration of which the solutions in the three small bottles should still remain perfectly clear, and likewise the extremities of the dipping tubes be free from stains—the arsenical solution, previously freed from oxidizing agents and concentrated to a bulk not exceeding 25 c.c., is very gradually introduced into the flask through the funnel tube, the last portions being washed down by a jet of distilled water from a wash-bottle. The silver solution in the second bottle at once commences to darken, and in a few seconds to throw down a precipitate of finely divided metal. If the arsenical solution has been carefully added, so that the evolution of gas is steady, and provided the proportion of arsenicum does not greatly exceed 10 milligrams, no change will be observed in the silver solution contained in the third bottle. At the expiration of from five to ten minutes, the apparatus is dismantled, the silver

precipitate filtered off, washed, dried, ignited with its filter in a porcelain crucible, and weighed. Its weight, minus filter ash, multiplied by $\cdot 1157$, is the weight of arsenicum, or by $\cdot 1527$, the weight of arsenious acid in the solution under examination.

The following table indicates the results obtained by operating upon known quantities of arsenic :—

$\cdot 292$ gram pure As_2O_3 was dissolved in distilled water with the aid of a little hydrochloric acid, and the solution diluted to 500 c.c.

5 c.c. of the solution containing $\cdot 00292 \text{ As}_2\text{O}_3$ gave
$\cdot 0154 \text{ Ag} \times \cdot 1527 = \cdot 00235 \text{ As}_2\text{O}_3$.
5 c.c. of the solution containing $\cdot 00292 \text{ As}_2\text{O}_3$ gave
$\cdot 0156 \text{ Ag} \times \cdot 1527 = \cdot 00238 \text{ As}_2\text{O}_3$.
5 c.c. of the solution containing $\cdot 00292 \text{ As}_2\text{O}_3$ gave
$\cdot 0154 \text{ Ag} \times \cdot 1527 = \cdot 00235 \text{ As}_2\text{O}_3$.
5 c.c. of the solution containing $\cdot 00292 \text{ As}_2\text{O}_3$ gave
$\cdot 0158 \text{ Ag} \times \cdot 1527 = \cdot 00241 \text{ As}_2\text{O}_3$.
10 c.c. of the solution containing $\cdot 00584 \text{ As}_2\text{O}_3$ gave
$\cdot 0344 \text{ Ag} \times \cdot 1527 = \cdot 00525 \text{ As}_2\text{O}_3$.
10 c.c. of the solution containing $\cdot 00584 \text{ As}_2\text{O}_3$ gave
$\cdot 0340 \text{ Ag} \times \cdot 1527 = \cdot 00519 \text{ As}_2\text{O}_3$.
20 c.c. of the solution containing $\cdot 01168 \text{ As}_2\text{O}_3$ gave
$\cdot 0740 \text{ Ag} \times \cdot 1527 = \cdot 01075 \text{ As}_2\text{O}_3$.

The loss in each experiment not exceeding the fraction of a milligram.

As regards the presence of other substances in the solution under examination, which by forming gaseous compounds with hydrogen might decompose nitrate of silver, and so interfere with the estimation of the arsenic, there are to be considered five, viz., antimony, sulphur, tellurium, selenium, and phosphorus. A preliminary examination would of course decide as to the first, and indicate a special method of procedure, whilst any sulphur, selenium, and tellurium, would be arrested by the acetate of lead solution in the first bottle. The occurrence of phosphorus in its lower forms of oxidation would in most cases be rare. If, however, its presence is suspected, the solution must be treated with a little nitric acid, to convert into phosphate, the excess of acid being afterwards expelled by suitable means.

Estimations of traces of arsenicum occurring in different forms and under varying conditions, by the method I have described, have yielded excellent results. The following will suffice as examples :—

Experiment 1.— $\cdot 5$ gram arsenious acid, dissolved in a little dilute hydrochloric acid, was digested for some hours with portions of a sheep's stomach. The fluid portion was then removed, and

distilled with strong hydrochloric acid in the manner recommended by Taylor,* and the distillate diluted to 500 c.c. Five c.c. of this solution representing 5 milligrams of arsenious acid, estimated by the process I have described, yielded .029 gram Ag, or .0044 gram As_2O_3 .

Experiment 2.—2 grams of pure subnitrate of bismuth were rubbed into a paste with 50 c.c. of a standard solution of arseniate of ammonium, containing .0372 gram of the salt. The mixture was then heated for some time with 10 c.c. strong sulphuric acid, until all the nitric acid was driven off. It was then diluted and filtered, and the basic sulphate of bismuth on the filter repeatedly washed with distilled water, the mixed filtrate and washings being diluted to 100 c.c. 10 c.c. of this solution yielded .012 gram Ag, equivalent to .00356 Am_3AsO_4 found, against .00372 calculated.

Experiment 3.—The mother-liquor, weighing 4 pounds, or 1818 grams, obtained from the crystallization of 100 pounds of bismuth metal, was examined for arsenicum in the manner described. 75 grams were used in the estimation, and yielded .015 gram Ag, equivalent to .0017 As, representing .0412 gram As in the 100 pounds of bismuth. The last experiment affords a good illustration of the delicacy of the process, the amount of arsenicum to be estimated amounting to but little more than $\frac{1}{2}$ grain in 700,000 grains of the bismuth, or less than one part in a million.

I need scarcely say that I lay no claim to originality as regards the chemistry of the method I have described. It is founded upon a reaction long well known, although, so far as I have been able to ascertain, its application to quantitative analysis has not been previously noted. Neither do I suggest that it should supersede the magnesia or any other process in present use. But in those cases where the proportion of arsenic to be estimated is exceedingly small, and it is yet necessary to assign to it a more precise limit than is conveyed by the additional "trace," I can strongly recommend the method, as being both easy in its application and accurate in its results.

My thanks are due to my assistant, Mr. H. P. Cooper, for the care and skill with which he has performed a large number of analyses bearing upon the subject of this paper.

Mr. PLOWMAN said Mr. Fletcher had stated he had kept his apparatus going some five or ten minutes before dismantling it to weigh the silver, and he was somewhat surprised to hear that

* *Pharmaceutical Journal* [2], ii., 411.

length of time mentioned, because some years ago he was making some experiments, the success of which depended on the complete conversion of arsenicum into arseniuretted hydrogen, and he then found that five hours was not sufficient, nor yet five days, nor as far as he remembered when the process went on continuously for a whole week. Operating with pure zinc, he allowed the process to go on for a week, and still found traces of arsenicum being given off as arseniuretted hydrogen. As Mr. Fletcher's results came out very fairly, the question arose as to whether the equation put on the board exactly represented the decomposition which took place when arseniuretted hydrogen passed through a solution of nitrate of silver, or whether there was not some other change which caused a larger deposition of silver, and so account for the results. His own experience was that the arsenicum would not come off entirely.

Professor ATTFIELD said that it occurred to him that Mr. Fletcher was somewhat on the horns of a dilemma. If the process were conducted too rapidly, it was possible he might not collect all his arsenicum; whilst if he conducted it too slowly, he might get metallic silver precipitated in his solution, not derived from the action of the arseniuretted hydrogen, but from the action of the hydrogen itself on the nitrate of silver. He appeared to have conducted his experiments fairly rapidly, but it was to be noticed that he did not get out the theoretical quantity of arsenicum by a good deal. He was only working with minute proportions, and it was astonishing that he should get out so much, but still it appeared that he did not get within 10 or 20 per cent. of what he put in. Mr. Fletcher had mentioned a number of substances in which arsenicum had been found by different chemists, to which he might add common salt, in which it was found—of course in utterly insignificant traces—many years ago by Campbell.

Mr. SCHACHT desired to say one word in favour of the process for the delicate detection of minute quantities of arsenicum to which Mr. Fletcher had alluded, but passed over rather slightly, as though he was scarcely disposed to recommend it. He referred to the one devised by Dr. Herapath. He happened to see Dr. Herapath's process of work, and at the time repeated some of his experiments, and remembering that it was a very easy process, and one which required very little beyond the first experiment, and then a very delicate and careful weighing, he thought it deserved rather more respect than it had received at Mr. Fletcher's hands. It certainly acted very nicely down to the limit of a milligram.

Mr. REYNOLDS said there was a recent case of detection of arsenic in minute quantities which, he believed, had not yet been published. Professor Thorpe, of the Yorkshire College, had lately investigated the condition of the urine in a fatal case of poisoning by absorption of arsenical green from the walls of a house, but he had to be satisfied with reporting abundant traces. This was a case in which it would have been very satisfactory if a more delicate quantitative test for arsenic had existed.

Mr. ALLEN said although it was true there was a sensible loss, they could all see that when dealing with such minute quantities, literally only of $\frac{1}{1000}$ ths of a grain, that these were extraordinarily accurate results. It was no use to say, as Mr. Schacht had done, that Dr. Herapath's method was a very satisfactory one; no doubt it was so far as it went, but the objection was that in his method it was the metallic arsenic which had to be weighed, and there was not the advantage of a greatly increased weight. Now, Mr. Fletcher weighed nine times the weight of silver which he had of arsenic, and therefore for every .01 of a grain of metallic arsenic he had .09 of metallic silver to weigh. Professor Attfield suggested that it was not certain that metallic silver was not thrown down in some cases by the hydrogen; but Dr. Russell showed that only perfectly neutral nitrate of silver was apt to be precipitated by a current of pure hydrogen, and that the slightest trace of acid prevented such action. Therefore, Mr. Fletcher had only to take the precaution of having it faintly acid, and there would be no fear of any precipitation of metallic silver. It was a most convenient method provided all the arsenic was got off in gas in the time mentioned. It did not prevent one estimating it by any of the ordinary processes in the filtrate from the precipitated silver, though of course that involved the assumption (the truth of which Mr. Plowman seemed to doubt) that all the arsenic passed off in the form of gas. From his own experience, dealing with much larger quantities, he should be inclined to agree with Mr. Plowman that it did not all go off in the form of gas. On the other hand, he was quite inclined to suppose, as Mr. Fletcher's experiment showed to be the case, that, when dealing with minute quantities, practically the whole, or within a few per cent. of the whole, would be found in the form of gas. He would suggest to Mr. Fletcher that he might modify the form of the apparatus so as to insure a more complete absorption of the arseniuretted hydrogen. It was not impossible that the low results might be due quite as much to incomplete absorption as to incomplete conversion into arseniuretted

hydrogen. Mr. Fletcher had pointed out one or two objections to the ordinary magnesia process, that it was not applicable to small traces, and that the precipitates were of variable composition; but it did not matter if they varied if the process was only used to estimate traces. What did it matter whether it contained one-half a molecule of water or more, if one were only estimating traces? Hence Mr. Fletcher's objections were not really to the point, but nevertheless he had shown a method by which they could weigh nine times the amount of the thing they wanted to estimate; that was a matter of prime importance. Mr. Fletcher made mention of oxidizing such things as the lower acids of phosphorus by means of nitric acid, but he should contend that nitric acid was a very bad oxidizing agent in a dilute solution; it would be far safer to use permanganate.

Professor ATTFIELD said the proportion obtained as against the proportion of arsenic used was important. One could see at once that if 29 milligrams were used and 23 were recovered, this was very close to the original weight, being in fact only 6 milligrams out; but the question was this, if 29 grams were put in, would 23 grams be got back, or 29 grams minus 6 milligrams only?

Mr. FLETCHER said with regard to the time allowed for the gas to pass through the solution before adding the arsenical solution, he thought if no darkening in colour took place in from five to ten minutes one might be quite satisfied that it was free from any appreciable quantity of arsenic. Even if traces were present it would not interfere with the gravimetric estimation of the arsenic. One might get a solution which would give what were apparently very dense mirrors with Marsh's test, but which when tested with nitrate of silver would scarcely give the faintest possible coloration. As to the equation, which it was remarked might not represent the reaction, he simply gave it because it expressed the salient point of the decomposition. As to Professor Attfield's remarks as to the discrepancies in the results obtained from the quantity of arsenic used, it should be recollected that he did not recommend this process for large quantities of arsenic; in fact, for a solution containing centigrams of arsenic the magnesia method might be used. He was not putting this forward in place of the magnesia process when dealing with a weighable precipitate. But one thing was quite certain, with a solution containing only 2.9 milligrams of arsenious acid, one would never get a weighable precipitate with magnesia. If the result came to be multiplied into percentages it looked very large, but when it was recollected that there were

barely 3 milligrams operated upon, the results were not so bad. He was very sorry that Mr. Schacht should have misinterpreted his reference to Dr. Herapath's process. He did not in the least degree intend to disparage that process; in fact, it was Herapath's paper which first suggested the method he now brought forward. As Mr. Allen had said, by Herapath's process one could only weigh the arsenic, and the molecular weight being low when there was less than a milligram, it became almost impossible to get true results. He quite agreed with Mr. Allen's suggestion that probably a more complete form of apparatus would be better than the three bottles. If a larger quantity of arsenic were present, and the gas was desired to be generated more rapidly, there could be four or five bottles. It was a very simple matter to filter off the precipitate out of each bottle.

A vote of thanks was passed to Mr. Fletcher.

The next paper read was on—

EMULSIONS.

By A. W. GERRARD, F.C.S.

Demonstrator of Pharmacy and Materia Medica to University College.

This communication is the result of some experiments made with the view of determining what would prove the most valuable agents for general use to render oils, balsams, resins, and oleo-resins in the form of emulsions. Also to arrange formulæ, practical and reliable, for the most commonly prescribed substances required to be dispensed in the emulsion form.

The subject, I know, is one upon which much has been already said and written, and yet withal there exists among pharmacists a wide difference of opinion and practice as to the material or process which shall best emulsify any given oil. The truth of this observation may be demonstrated by giving the same prescription, say for $\frac{1}{2}$ ounce of castor oil to be rendered into 2 ounces of emulsion according to art, to six different chemists to prepare; the product will vary most astonishingly, no two being alike either in colour or fluidity, and some not even emulsified at all. This want of uniformity in our art applies not only to emulsions but to various other preparations; and although some slight variation may be expected in preparations obtained from products themselves subject to natural variation, the difference is generally far too great to be explained on those grounds, and is often sufficient to create sus-

picion or distrust in the mind of a patient, to whom no amount of explanation is satisfactory. This is matter for regret, and enables me to make the observation that I believe the blame for much of this can be traced to a deficiency in pharmaceutical education ; for it is a fact that actual practical pharmacy, I mean the real manufacture of preparations and practical use of apparatus, forms no part of the curriculum of our school. The remedy suggests itself.

The emulsifying agents most commonly employed and regarded with most favour are the mucilages of tragacanth and acacia, likewise their powders. My experiments have been confined to these substances, previous results having proven that where honey, yolk of egg, and almond powder are recommended for special purposes, acacia or tragacanth answers equally well or better.

To decide the respective merits of tragacanth and acacia some forty experiments were conducted with each gum, both in powder and in mucilage, mixed with various oils and resins in various proportions, and by varied manipulation, the results obtained being altogether in favour of powdered gum acacia, the emulsions it forms being perfect milk-like fluids, in which the eye cannot distinguish any particle of oil ; they pour easily from the bottle, and mix with water in any proportion without separation. Most of the forms given below have been kept for two months and show no deterioration.

For general purposes when using powdered gum acacia, it is essential that it be of the best quality and almost white. The substance to be emulsified, if it be a fluid, must be measured in a dry measure and poured into a dry mortar ; the necessary amount of powdered gum can now be well incorporated, next the portion of water indicated in each case, but by no means let it be measured in the oily measure. Now stir well, taking care that every particle of oil is brought within range of the disruptive mechanical motion ; want of attention to this part of the operation is a frequent source of failure, for if any oil gets up the side of the pestle or mortar and is omitted from the emulsifying process, it will most certainly show itself by floating upon the surface of the finished product, spoiling what might otherwise have been a perfect preparation.

When the substance to be emulsified is a solid or semi-solid body with resinous properties, it is advisable to dissolve it in twice its quantity of rectified spirit, then treat in the same manner as for fluids. Syrups, tinctures, and flavouring agents, when ordered, should, as a rule, be added last.

Emulsion of Cod Liver Oil.

Cod Liver Oil	4 ounces.
Essential Oil of Almonds	4 minims.
Powdered Gum Acacia	1 ounce.
Syrup	1 „
Water	to 8 ounces.

Mix the gum with the oil, then place on the mixture 2 ounces of water, and stir till the emulsion is formed; then add the remaining water, essence, and syrup.

Emulsion of Castor Oil.

Castor Oil	4 drachms.
Powdered Gum Acacia	80 grains.
Essential Oil of Almonds	1 minim.
Simple Syrup	2 drachms.
Water	to 2 ounces.

Mix the powder with the oil, then add 2 drachms of water, and stir till the emulsion is formed; add the remaining water, syrup, and essence.

Emulsion of Turpentine Oil.

Oil of Turpentine	4 drachms.
Powdered Gum Acacia	2 „
Syrup	2 „
Water	to 2 ounces.

Mix the powder with the oil, add $\frac{1}{2}$ ounce of water, and stir till the emulsion is formed; then add the remainder of the water and the syrup.

Oil of turpentine is considered one of the most troublesome bodies to emulsify; prepared by this form there is no difficulty.

Emulsion of Balsam of Copaiba.

Balsam of Copaiba	3 drachms.
Powdered Gum Acacia	3 „
Simple Syrup	6 „
Water	to 6 ounces.

Mix the powder with the balsam, and add 6 drachms of water, then stir till the emulsion is formed; gradually add the remainder of the water and the syrup.

Emulsion of Resin of Copaiba

Resin of Copaiba	2 drachms.
Rectified Spirit	4 „
Powder Gum Acacia	4 „
Water	to 6 ounces.

Dissolve the resin in the spirit, add the powdered gum and mix well; add now an ounce of water, stirring till the emulsion is formed; make up to 6 ounces with water.

Emulsion of Balsam of Peru.

Balsam of Peru	3 drachms.
Powdered Gum Acacia	2 „
Simple Syrup	6 „
Water	to 6 ounces.

Rub the powder well with the balsam, add 3 drachms of water, and stir till the emulsion is perfect; then add the remaining water and syrup.

In emulsions containing resins or bodies heavier than water, there is generally a sediment forms; it is so with the two previous forms, but there is no aggregation into a hardened mass, and a slight shake of the bottle puts all right again.

Emulsion of Chian Turpentine.

Chian Turpentine	2 drachms.
Ether	4 „
Powdered Gum Acacia	2 „
Water	to 6 ounces.

Dissolve the turpentine in the ether, and filter, washing the filter with a drachm of ether; mix well with the gum, and add $\frac{1}{2}$ ounce of water, stirring till the emulsion is perfect; lastly, add the remaining water.

Attention has already been called to the superiority of acacia over tragacanth to emulsify Chian turpentine, and the statement cannot be disproved.

Many of these forms have been well tested and practically made by large classes of students, and the results have been most satisfactory.

Before leaving the subject, I will say that no rule of thumb practice should be attempted in making an emulsion; success may occasionally occur, but annoyance and waste of time and material is the invariable result.

In conclusion, powdered gum acacia in my hands has achieved the greatest success, and so far as I am concerned merits the distinction of being called the perfection of emulsifying agents.

The PRESIDENT said this paper was perhaps one of the most interesting practically to the pharmacist which had come before the meeting.

Mr. GREENISH thought the Conference was very much indebted to any pharmacist who had thrown some light on the formation of emulsions. As a practical pharmacist he knew of difficulties in connection with the matter. With regard to the use of pulv. acaciæ, it was not new, and they were indebted to their brothers across the Atlantic for a hint in that respect.* Two or three pharmacists had written on the subject, and he thought there was not much more to be said upon it, but it always did good to bring an important matter forward again. Sometimes tragacanth was used, and his experience quite agreed with Mr. Gerrard, that it was not really suitable for the purpose. He should like pharmacists to occasionally put their emulsions under the microscope, when they would soon see the difference between a good one and a bad one; the small globules of oil would in one case be much larger than in the other. Mr. Gerrard laid stress on using good acacia, and it was only the best which should be used. It was one of those substances which would repay any pharmacist for paying attention to. Some was introduced into the market which was not soluble, and that in its emulsive qualities would very much resemble tragacanth. Gum acacia was an exudation, and the best to use for this purpose was one perfectly soluble.

Mr. PLOWMAN said it was quite true that the suggestion to use gum acacia was not new, but he must do Mr. Gerrard the justice to say that instead of a mortar being used, Mr. Winchell Forbes advised the use of a phial, and gave an instance of a turpentine emulsion in which the turpentine was to be put into the phial first and shaken up, the pulv. acaciæ was next added, the two were shaken together, a definite quantity of water being added first, and then the remainder gradually. Mr. Gerrard's process seemed to consist in using a mortar, and he had given definite formulæ.

Mr. SAVAGE said the subject was an old one, but members were much indebted to Mr. Gerrard for the definite preparations he had given and the simplicity of the method. With regard to the use of gum acacia, it was recommended in Gray's "Supplement to the Pharmacopœia" for 1831, in mixing oil of almonds.

A MEMBER said he had found a little difficulty in making emulsions with gum acacia, having had occasion to use a cod liver oil emulsion in his own family. On pouring it out, if the bottle were

* For a *resumé* of the work of Forbes, of Wilder, and of Gregory, see the *Year-book of Pharmacy*, 1877, p. 235.—ED. TRANS. BRIT. PHARM. CONF.

left in a dry room a layer of gum was left on the top, and every successive pouring left an additional layer, which was rather an objection. In other respects he found it form an excellent emulsion.

Mr. RICHARDSON (Aberdare) asked if it would not be better to add the oil to the gum.

Mr. COTTRELL suggested that if sugar were added at first, it would assist the process very much indeed, and the proportionate quantity of water could be added afterwards, although no doubt it was a heresy if no syrup were ordered to put syrup in. It was a small quantity Mr. Gerrard had, but he would give a form for a larger quantity of emulsion, which would last for years, would not separate, and would be as good in five years' time as at present. It was one he was frequently making, though it was not used by those suffering from disease, but was more often taken by those persons who were in good health. He had a large mortar with the pestle through a ring, into which he put twenty-four eggs; it was not necessary to use gum for an emulsion, and he used a fine almond powder, which he obtained from a house in London, which would emulsify anything. It was very much Mr. Gerrard's system. The twenty-four eggs were put in the mortar, and then he got six ounces of good Durham mustard, two pounds of crystallized brown sugar; these were worked together well until the cracking noise which had been referred to was heard; and hard work it was. Then he added sixty-four ounces of the very finest sublimed oil, and then when that was well mixed it was a beautifully smooth yellow emulsion, to which he added four pints of vinegar and three ounces of Tarragona vinegar. It was exactly the same form as Mr. Gerrard had given.

Mr. WILLIAM EVANS desired to thank Mr. Gerrard for the paper. Country chemists sometimes found great difficulty in dispensing some prescriptions. The customers sometimes went to town and got their prescriptions prepared there occasionally in a very different manner; and when they came back to the country, if the prescriptions were not dispensed in exactly the same way, they were not satisfied. He should be very glad if some gentleman present would make out some notes as a guide to apprentices and to serve as a standard as to how things should be prepared; there ought to be more uniformity in practice amongst chemists.

Mr. WARD (Sheffield) had prepared many emulsions, but must express his thanks to Mr. Gerrard for the simple way in which he had introduced his method. He should like to ask if he had allowed his emulsions to stand for a year, because some he had prepared stood very well for three or four months, but owing to a change of

temperature, or some other circumstance, they did not keep well beyond that time.

Mr. GERRARD said his principal object was to show the simple and easy manner in which an emulsion could be made by the use of powdered gum acacia, and also to give formulæ which would introduce more uniformity of practice amongst chemists in the making of these preparations. He was quite aware that gum acacia had been recommended previously, but no good reliable formulæ had been given for the making of emulsions. It was necessary for him to arrange formulæ for his demonstrations, and as they had turned out satisfactorily, he thought it would be well to bring them before the Conference. Mixing the ingredients in a phial did not give so good results as with a pestle and mortar. It was always difficult to get away the last traces of oil from the side of the bottle. With regard to the emulsion becoming gummy on the surface, and thickening, it really became clotted and difficult to pour, and consisted mainly of a mixture of oil and gum, and that was especially so with cod liver oil. With reference to castor oil emulsion, when it was prepared with gum acacia, unless some essential oil were added, it underwent some change, and became sour; but the addition of some essential oil to the emulsions would prevent that. His experience as to keeping did not extend beyond three months at the outside. One gentleman spoke of the advisability of adding syrups to the water before making the emulsions, but that rather retarded than aided the process. The flavouring agent and the sugar should as a rule be added last.

A vote of thanks was passed to Mr. Gerrard.

The next paper read was entitled—

DETERMINATION OF THE STRENGTH OF ALCOHOLIC SOLUTIONS OF CHLOROFORM.

By J. C. THRESH, B.Sc., F.C.S.

In examining a solution of chloroform in spirit of wine, it is evident that unless the density of the alcohol used to dissolve the chloroform is accurately known, the specific gravity of the solution affords no indication whatever of its strength. When, therefore, I set about the task of reporting upon commercial chloric ethers, I found that first of all it would be necessary to devise some process

for estimating the chloroform, as my search in text-books and dictionaries for such a process was in vain.

Fortunately, however, a method was devised which, when put to the test of actual experiment and slightly modified, left nothing to be desired, neither on the score of simplicity nor accuracy.

The requisites are an accurately graduated tube, about .5 metre in length and 10 to 12 millimetres in diameter, or a 50 c.c. burette, graduated in one-tenth c.c. and provided with a stopcock; a dilute sulphuric acid, made by diluting 1 part of oil of vitriol with 6 parts of water; and a supply of petroleum ether (the gas oil or gasoline of commerce), tinted rose colour by immersion in it for a minute or two of a piece of alkanet root.

When a dilute alcohol of, say, specific gravity .900, is poured into the burette, its volume accurately noted, and a quantity of the gasoline added, and the mixture agitated,—when the whole has been allowed to stand for some time so that complete separation has taken place, it will be found, providing the temperature has not varied, that the dilute spirit occupies exactly its original volume; it has either yielded nothing to the gasoline, or, as is improbable, the petroleum ether has taken up exactly as much spirit as the spirit has dissolved of petroleum ether. If now, however, the experiment is repeated, substituting a mixture of chloric ether and water for the dilute spirit, it will be found that the aqueous solution has decreased in volume to an extent proportional to the percentage of chloroform present.

As thus performed the results are not entirely satisfactory, since the mixture has to stand a considerable length of time before the surface of demarcation between the two fluids becomes perfectly distinct, and both being colourless and of nearly the same refractive index, there is a little difficulty in taking the reading correctly. Both these obstacles are overcome by substituting dilute sulphuric acid for the water, and tinting the petroleum ether with a colouring matter insoluble in dilute alcohol.

To obtain the utmost possible accuracy the analysis is conducted as follows, first assuming that chloroform does not constitute more than 15 per cent. of the mixture.

Having secured the stopcock of the burette, pour in the dilute acid until the column reaches approximately the 30 c.c. graduation, then introduce with a pipette 20 c.c. of the chloroform solution, cork tightly, and shake vigorously until thoroughly mixed. Now fix in a stand and allow it to rest for about half an hour, or until all air bubbles have disappeared, and the mixture, which upon

agitation rises several degrees in temperature, has again acquired the temperature of the room. Tap gently, if necessary, to cause any floating globules of chloroform to sink to the bottom; then very carefully pour on about 10 c.c. of the coloured gasoline. This must be poured very carefully down the side of the tube, so as not to mix in the least with the acid solution. Now re-insert the cork, fix the tube in a perfectly upright position, and read off the height of column of colourless fluid. In my experiments I have always read from the lowest point of the slightly convex base of the coloured liquid, and to obtain the utmost accuracy have fixed the tube with the line of demarcation of the two fluids exactly level with the eyes and between the latter and a fine line in the same plane made upon the window. Then, by aid of a small hand lense, such as is used for viewing prints, etc., a difference in the length of the column corresponding to one-fortieth of a c.c. can be read without difficulty. In fact the expansion of the column of fluid produced by holding the tube in the warm hand for a minute or two can easily be detected. The tube is next shaken thoroughly for two or three minutes, and again placed in its support, until the mixed fluids have completely separated. This does not take many minutes; but before reading off the reduced column of dilute spirit, it is best to allow the tube to remain for about half an hour, so as to be certain that it has the same temperature as the apartment, and if this temperature is not the same as at the time of the first reading, a correction, to be described subsequently, must be made, if the greatest accuracy is desired.

To determine approximately the expansion co-efficient of a mixture of chloroform spirit and water, several readings were taken during one experiment, with the tube immersed up near to the line of demarcation in a larger tube containing water at known temperatures. The mean apparent coefficient of expansion for 1° C. was .0005.

When, therefore, the first reading, taken before agitation with the gas oil, is "a," and the second reading, taken after agitation, is "b" cubic centimetres, if the temperature varied at the times when the observations were taken "t" degrees, then the required quantity is—

$$\left\{ a - b (1 + t \cdot 0005). \right\}$$

+ or - according as the temperature has decreased or increased.

In the following tabulated or experimental results, the first seven determinations were made without noting the temperatures.

Percent. of Chloroform by volume, added		Percent. of Chloroform found.	
1.	per cent.	1.	per cent.
7.	"	7.25	"
3.	"	2.75	"
5.	"	5.	"
2.	"	2.	"
5.	"	4.5	"
11.66	"	12.	"
11.66	"	11.87	"
2.15	"	2.05	"
3.85	"	3.75	"
8.09	"	8.15	"
9.87	"	9.7	"
33.3	"	33.3	"

In consequence of the errors in sixth and seventh determinations being more than .25 per cent., I was led to make the experiments for determining the effect of temperature changes, and where necessary the correction was made in all subsequent experiments. As an increase of temperature of 2.5° C. will cause an error of .5 per cent., it is obvious that except when a mere approximation is required, thermometer readings must be taken and corrections made.

In the last experiment only 10 c.c. of the chloroform solution were employed, and 20 c.c. of gasoline were added instead of 10. In the only experiment made with a solution containing over 50 per cent. of chloroform, the result was much too low, and it was obvious that the details would have to be considerably modified to make the method practically applicable for such solutions.

This paper was followed by a—

REPORT ON COMMERCIAL SPECIMENS OF SAL VOLATILE AND CHLORIC ETHER.

By J. C. THRLSH, B.Sc., F.C.S.

In preparing this paper for the present Conference, I have had two objects in view: first, to ascertain definitely what were now being retailed and dispensed for chloric ether and sal volatile, in the hope that by reventilating this question in conference, something practical may be suggested for establishing uniformity; and

second, to examine and report upon specimens of such preparations as were sent by manufacturers when æther chlor. and sp. ammon. co. were ordered.

For the first purpose a circular letter was sent out to about one hundred chemists, including the heads of most of the best known dispensing establishments, the subject matter of which ran as follows :—

“ I am preparing a short paper for ensuing Conference on ‘ Sal Volatile and Chloric Ether,’ and shall esteem it a favour if you will furnish me with a reply to the following query :—‘ What are you in the habit of dispensing and retailing when chloric ether (æth. chlor. or sp. æth. chlor.) and sal volatile (sp. ammon. co. or sal volatile) are prescribed or asked for ? ’ ”

In reply to this query, taking first the chloric ether question, twenty-seven firms said that both in dispensing and retailing the sp. chlorof., B.P., was used for chloric ether and sp. æther. chlor. ; eleven firms used Duncan’s chloric ether only ; one used Duncan’s sp. chlorof., B.P., or a solution of one part of chloroform in nine of spirit, according to circumstances ; another “ a special distilled product ; ” another “ a distillate from chlorinated lime and alcohol ; ” another “ æther chlor., P.L., ” the existence of which, no doubt, most of you were previously ignorant of ; another uses sp. chlorof., B.P. for sp. æther. chlor., but a solution of chloroform (1 in 10) for æther chlor., whilst fourteen always employ a solution of chloroform in alcohol, the strengths varying from 1 in $7\frac{1}{4}$ to 1 in 10 by volume ; finally, one firm replied that they dispensed chloric ether, *not* sp. chlorof. B.P., the “ not ” being underlined.

It appears, therefore, that in about half the number of cases, chloric ether or sp. æther chlor. is understood to be represented by the B.P. sp. chloroformi ; whilst in the other half stronger solutions of chloroform are supposed to be what the prescriber requires. As will be seen from analyses of some of the distilled chloric ethers, the variation in chloroform strength in the preparations dispensed for “ chloric ether ” is from 2 per cent. to 12·35 per cent.

For sal volatile and sp. ammon. co., forty-four firms replied that both in dispensing and retailing they invariably employ the B.P. sp. ammon. arom. ; six use the sp. ammon. co. of the 1836 P.L. ; one the sp. ammon. co. of 1787 P.L. ; six use special preparations of certain makers ; one a “ sp. ammon. arom., sp. gr. .918 ; ” and one firm replied that they always dispensed sal volatile, *not* sp. ammon. arom., B.P., but no intimation as to nature or maker was

vouchsafed. Many chemists, whilst invariably using the sp. ammon. ar., B.P., for dispensing, when sal volatile or sp. ammon. co. is prescribed, yet retail special preparations as sal volatile.

It appears, therefore, that in the very great majority of cases the B.P. preparation has superseded all other forms of sal volatile.

The samples of chloric ether and sal volatile examined were all obtained either from manufacturers or large wholesale houses, with perhaps three exceptions which were obtained from retail houses.

In response to my inquiries for specimens of the articles sent out when chloric ether and sal volatile were ordered, all the firms to whom I wrote were kind enough to send me two or more samples, in many cases together with replies explaining what course they usually followed under the circumstances. Many, for chloric ether, supplied Duncan's preparation; others "special distilled products;" others, the B.P. sp. chloroformi; and others, solutions of chloroform in spirit, stronger than the B.P. preparation. The specific gravity was determined by aid of a balance and 10 gram sp. gr. bottle, the temperature at each observation being recorded. The sp. grs. of two samples were then determined at temperatures varying from 14° to 22° (the extremes between which all had been taken), and it was found that a difference of one degree Centigrade affected the sp. gr. by (very approximately) .001. In the table appended, therefore, all the densities have been corrected for 15° C., and expressed to the nearest third decimal. It will be seen upon comparing the two columns that the specific gravity is alone no criterion whatever as to chloroform strength; for example, one specimen, density .893, contained 3 per cent. chloroformi, whilst another, sp. gr. .894, contained $7\frac{3}{4}$ per cent. The density of the sp. chlorof. in no case reached .871 as indicated in B.P.; but this I attribute to the fact that a s.v.r. of 60 o.p. is much more generally used than the 56 o.p. spirit of the British Pharmacopœia.

The results obtained by actual analysis therefore corroborate the statement elicited by the circular letter. There is, however, one little matter for surprise, and that is the small percentage of chloroform contained by the distilled "chloric ethers." There seems to be an impression abroad that this preparation, though more miscible with water than the B.P. sp. chloroformi, yet is much richer in chloroform. This is undoubtedly a fallacy, the preparation which so many understand to be intended when "chloric ether" is prescribed, containing only from 2 to 3 per cent. of chloroform, although judging from its specific gravity (which has deceived so many), it would contain 7 to 9 per cent.

In the following table, in the first column, is placed the name of the article as taken from the label on sample bottle, the word "special" signifying that the label also intimated that the preparation was a speciality of the firm whose name it bore.

I perhaps ought to add that the chloroform was estimated by the method described in the paper just read, and that in taking burette readings I did not attempt to read off to less than $\frac{1}{10}$ th of a c.c., corresponding to nearest $\frac{1}{4}$ per cent.

*Tabulated Results of Analyses of the Chloric Ethers of
Commerce.*

	Sp. Gr. at 15° C.	Percentage by volume of Chloroform.
Chloric Ether, Special	·878	2·5
Sp. Æth. Chlor.	·893	3·
Sp. Chlorof.	·862	5·
Æther Chlor.	·885	7·
" "	·861	4·5
Sp. Chlorof. B.P.	·865	5·
Æther Chlor. Dest.	·879	2·
Æther Chlor.	·872	7·
Chloric Æther	—	9·5
Sp. Chlorof.	·865	4·5
Chloric Ether, Special	·887	2·5
" "	·894	7·75
Æther Chlor.	·922	12·25
" "	·894	9·5
Dist. Æth. Chlor	·918	3·
Æther Chlor.	·903	9·25
Sp. Chlorof.	·861	4·75
Æther Chlor.	·899	9·25
" "	·865	4·25
Sp. Chlorof.	·864	5·

Turning now to the sal volatile question, I found that, with perhaps one exception, every wholesale house made a sp. ammon. co. besides the B.P. sp. ammon. aromat., and in response to my application for a sample of what they usually sent out when sp. ammon. co. or sal volatile was ordered, in most cases samples both of the B.P. and the special preparations were sent me.

Several firms offered to give me any further information which I might require, and in correspondence with some of them I found that the process of the B.P. was not considered so satisfactory as it

should be, yielding a very variable product.* When working with quantities, if the distillation is stopped when the distillate has the correct sp. gr., a little ammonia is left in the retort, which is easily driven over if the distillation be continued a very little longer. It will be seen in the sequel that results obtained working on a small scale do not confirm this.

The whole of the samples were examined in the following manner:—First, the sp. gr. was determined by the aid of the balance and 10 c.c. sp. gr. flask, and the temperature noted. The contents of this flask were poured into a flask of about 200 c.c. capacity, in which had been placed 40 c.c. of a solution of hydrochloric acid, each c.c. of which contained .01825 gram HCl, corresponding to .0085 gram N H_3 (half a molecule). The mixture was slightly diluted, boiled for about a minute, tinted with neutral alizarin, and the freed acid determined volumetrically by a solution of soda, corresponding in strength with the acid solution. The number of c.c. of alkali required to impart a red tint was registered. 20 c.c. were then poured into another flask, holding up to a fiducial mark on the neck exactly 100 c.c., containing excess of a solution of barium chloride. The flask was then filled to the mark with water, vigorously shaken, and placed aside from six to twenty-four hours, or until the precipitate had so far subsided as to allow 50 c.c. of clear liquid to be drawn off by a pipette.

To this a little alizarin was added, slight excess of acid solution run in from a burette, and the excess titrated back with the standard soda.

Then if 'a' represent the number of c.c. of soda solution required in the first instance to neutralize the excess of acid added to the 10 c.c. of sample, 'b' the c.c. of acid required to neutralize the free ammonia in the second experiment, and 'd' the specific gravity of the spirit of ammonia at time of measurement, we have—

$$\cdot 085 \frac{b}{d} - \text{per cent. free } \text{N H}_3.$$

$$(40 - a) - \frac{\cdot 085}{d} - \text{per cent. } \text{N H}_3 \text{ free and combined.}$$

$$(40 - a - b) \frac{\cdot 240}{d} - \text{per cent. } (\text{N H}_4)_2 \text{C O}_3.$$

That the combined ammonia in the sp. ammon. ar. is in the state

* Thought by one firm to possibly be due to "exceedingly uncertain composition of the carbonate of ammonia of commerce." By another, "to impossibility of condensing all the ammonium carbonate (or carbamate) which first distils, without risking an explosion, by its blocking up the worm of condenser."

of normal carbonate appears most probable from the fact that it must of necessity contain less CO_2 than the original carbonate from which it was distilled, since, as previously pointed out by J. Miller,* when the mixture of ammonia spirit, etc., in the retort is heated, long before distillation commences, brisk evolution of CO_2 ensues, little or no ammonia passing over at same time, as is proved by passing the gas first through solution of barium chloride and then through baryta water. The former remains perfectly clear for some time after the latter has copiously precipitated. I attempted to determine the CO_2 in a sample of spirit, sp. gr. '873, distilled by myself, and containing 1.365 per cent. of combined ammonia, by treating with excess of acid and absorbing the gas evolved with soda lime. The CO_2 obtained was .325 gram, the theoretical quantity obtainable where the ammonia combined in form of normal carbonate is .308 gram. As the result, .325, would—on account of difficulty of preventing some free NH_3 , and possibly also of alcohol, passing into soda lime tube—be most probably too high, I think it confirms the conclusion that the spirit contains the normal carbonate.

The subjoined tables record results obtained in analyses of forty samples of sal. volatile.

Sp. Ammon. Arom., B.P.

	Sp. Gr.	Free NH_3 p. c.	$(\text{NH}_4)_2\text{CO}_3$ p. c.	Total NH_3 .
1.	.877	.601	1.337	1.067
2.	.869	.988	.248	1.076
3.	.872	1.297	.523	1.482
4.	.878	1.613	none	1.613
5.	.885	1.043	1.918	1.721
6.	.877	1.253	1.400	1.749
7.	.870	1.329	1.352	1.807
8.	.868	1.534	.772	1.807
9.	.880	1.165	1.876	1.830
10.	.871	1.481	1.486	2.009
11.	.894	1.492	1.584	2.054
12.	.865	1.941	.443	2.098
13.	.866	1.306	2.270	2.110
14.	.877	1.049	3.701	2.360
15.	.887	.978	3.950	2.376
16.	.869	1.614	2.320	2.436
17.	.873	1.325	3.824	2.678
18.	.874	1.777	2.659	2.718
19.	.875	1.435	3.995	2.849

* *Pharmaceutical Journal*, 3rd series, i., 742.

Specimens not B.P.

	Sp. Gr.	Free NH ₃ p c	(NH ₄) ₂ CO ₃ p c	Total NH ₃ p c.
Sp. Am. Arom., Old form . . .	.871	2.165	none	2.165
" " " . . .	.891	2.156	.161	2.213
" " " . . .	.916	1.624	1.395	2.096
" " Special . . .	.904	.999	1.803	1.634
" " " . . .	.911	.981	.448	1.140
" Co. P.L. (1836) . . .	.906	1.335	1.805	1.974
" " (1787) . . .	.840	.678	.657	.911
" " " . . .	.920	.444	1.043	.813
" " " . . .	.863	.560	2.111	1.308
" " Special . . .	.879	1.286	2.703	2.031
" " " . . .	.925	1.057	.200	1.121
" " " . . .	.911	1.008	none	1.008
Sal Volatile . . .	.911	.923	.553	1.119
" " " . . .	.871	.839	.383	.976
" " Special . . .	.916	.779	3.903	2.162
" " " . . .	.954	.142	4.481	1.699
" " " . . .	.885	1.370	2.007	2.113
" " " . . .	.880	1.371	1.745	1.970
" " " . . .	.910	1.009	3.982	2.326
Sp. Sal Volatile . . .	.840	1.311	1.883	1.981
Aromatic Sal Volatile . . .	.882	1.319	2.556	2.224

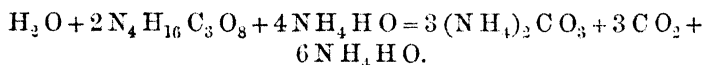
These results are far from satisfactory. That the products sent out as special preparations should have varied one can understand; but why the articles sent out by some of the largest distillers and wholesale houses as a B.P. product should vary to such an extent is simply unaccountable.

Mr. Martindale has asserted* that on the large scale it is impossible for the distillate to contain more than 1.7 per cent. of ammonia without being deficient in carbonic acid; but as several of the samples examined contained more than this amount of ammonia, and yet were richer in carbonate than samples containing less ammonia, I ventured to write to the distillers of sample No. 18, asking if the samples were prepared according to the B.P. directions, etc. In reply I was informed that such was the case, and that they usually found the residual liquor in the retort to contain a little carbonate of ammonia; but only in about the proportion of 1 oz. to every 6 gallons of spirit distilled. Sample No. 14 was distilled in the laboratory of a well-known member of the Conference, by the B.P. method, and yet is rich in both ammonia and carbonic acid.

To ascertain, if possible, how the loss could occur, I distilled a small quantity in a retort connected with a glass worm, the free

* *Pharmaceutical Journal*, 8rd series, i., 704.

end of which simply passed into the neck of the flask. Soon after the retort was first heated, CO_2 began to be evolved, and effervescence continued probably until the liquid commenced to boil, then a moist crystalline deposit formed in neck of retort, condensing worm, and side of flask; finally, the spirit distilled over, and towards the end of the operation carried over with it most of the crystalline matter deposited in the worm. The product in the flask, when the requisite quantity had been collected, contained a considerable quantity of crystalline matter, which, however, was entirely dissolved after a time, when occasionally agitated. The results of the analysis of this sample are given in No. 17. A second quantity was then distilled, and a syphon attached to the worm so as to keep the latter full of fluid, after a sufficient quantity had once distilled over to fill it; by this means at the last no trace of crystalline matter was left in condensing tubes. Care was also taken to prevent any loss of free ammonia. The results of the analysis of this sample are given in No. 19. In neither distillation did more than a trace of ammonia remain behind in the retort. It would appear, therefore, that when every care is exercised in making this preparation to condense all the ammonia, the amount of free ammonia in the product is approximately equal to the ammonia in combination. On the assumption that the combined ammonia exists in state of neutral carbonate, as appears almost certainly to be the case, the following equation will represent at least the initial and final products of the reaction:—



That sp. ammon. ar. will be deficient in ammonium carbonate, if after distillation the product is not by agitation or otherwise caused to take up the crystalline deposit which is formed, or if the condensing arrangement is such as not to completely condense the very volatile crystalline matter which first comes over, is evident. Possibly also where a length of time is required to raise a large quantity of fluid to the boiling point, further dissociation of the carbonate may take place, and loss of CO_2 ensue; but in this case we should expect to find most of the ammonia in the distillate, whereas, those samples noted for their poverty in carbonate are not rich in free ammonia.

If the equation above given correctly represents the reactions which take place, then a typical specimen of aromatic sp. of ammonia should contain 1.419 per cent. of free ammonia, and

1.424 per cent. of combined ammonia, corresponding to 4.007 per cent. of the neutral carbonate. On the small scale it is undoubtedly possible to produce a spirit differing very little from this; and if on the large scale the process really does yield a distillate varying to the extent indicated in the analyses, then either some other process for convenience of manufacturers should be devised for producing a more reliable article, or it should be made in smaller quantities at a time. But as many firms send out an article rich both in carbonate and free ammonia, one cannot understand why all should not do the same.

In conclusion, I would remark that any misunderstanding in prescribing and dispensing as to what is intended when *sp. ammon. co.*, *sal volatile*, or *æther. chlor.* and *sp. æther. chlor.* are prescribed, would be entirely obviated were these names placed as synonyms under head of *sp. ammon. ar.* and *sp. chloroformi* respectively, in the next edition of the B.P.

The PRESIDENT said he should regret that these valuable papers should be hastened over, but he feared there would not be time to discuss them at length.

Dr. SYMES, having had some correspondence with Mr. Thresh on this matter, felt some little interest in it. With regard to *sal volatile*, he thought the total amount of ammonia was really the great point of importance. But the proportion of caustic ammonia to carbonate of ammonia present was by no means unimportant. Although the total amount of ammonia in two samples might be the same, the flavour, taste, and character of the two would be quite different if one had a much larger proportion of caustic ammonia than the other. His experience was that if the *Pharmacopœia* process was followed it was a satisfactory one for preparing *sal volatile*, though he had some difficulty sometimes in getting the whole of the deposit left in the receiver to dissolve, and the hint given by Mr. Thresh was therefore valuable. With regard to chloric ether, he thought they all pretty well understood that the spirit of chloroform of the B.P. was introduced for the purpose of replacing the unsatisfactory and uncertain chloric ether which previously existed. Before that time chloric ether was charged a very high price, and was supposed to be very special in its character, because it was distilled, and was in some respects superior to all others; but he got into difficulties by using it, because he found that it was much weaker than that usually prepared by admixture.

He was quite at a loss to understand from the specific gravity of the chloric ether why it should not contain more chloroform. The facts proved to be that the spirit was weaker; it would not be 19 spirit and 1 of chloroform, but perhaps 17 spirit and 2 of water and 1 of chloroform that would account for the specific gravity. This great difference in usage in chloric ether was a very strong argument for carrying out the idea which he had put forth on the previous day, of having some kind of authority who should revise and render uniform these very unsatisfactory preparations.

A vote of thanks was passed to Mr. Thresh for his papers.

The next paper was a—

REPORT ON THE STRENGTH OF COMMERCIAL SPECIMENS OF *AQUA LAURO-CERASI*.

By JOHN WOODLAND, F.L.S., F.C.S., ETC.

Having obtained samples of this drug from different pharmacists, the following table will show the results of twelve estimations of hydrocyanic acid contained in them:—

No. of Sample.	Percentage of Acid.	No. of Sample.	Percentage of Acid.
1	·034	7	·0408
2	·037	8	·0292
3	·0291	9	very slight trace
4	·052	10	·034
5	·051	11	none
6	·024	12	none

Numbers 11 and 12 samples contained not a trace of hydrocyanic acid, and were evidently but an admixture of essence of almonds (*sine* prussic acid) and water, the odour being very different to that of the other samples, and alcohol was proved to be present.

In performing these estimations I used both nitrate of silver solution (or Liebig's process) and mercuric chloride with ammonia (or Hannay's process) with similar results. I also tried the method recommended by Vielhaber (*Year-Book of Pharmacy*, 1879, p. 24), but did not obtain such satisfactory results. In order to ascertain if there is any other constituent of cherry-laurel water,

besides hydrocyanic acid, that would react with nitrate of silver, and so vitiate the results obtained in volumetric estimation, I distilled one of the samples with ferrous sulphate and slaked lime, the distillate from which was not affected by the volumetric solution. The varying percentages shown in the above table indicate the instability of this preparation, the strength decreasing as the age increases, in what proportion I have as yet been unable to determine, but I intend during the coming year to perform experiments which will form the subject of a future paper. Through the kindness of Mr. Umney in supplying me with recently distilled samples of cherry-laurel water from the fresh and dried leaves, I have been able to ascertain the percentages of hydrocyanic acid contained in them.

In the sample prepared with fresh leaves I found '0524; in that distilled from the dry leaves '0204. I performed the experiment with the dried leaves to ascertain if in the process of drying the active principles (which, when treated with water yield hydrocyanic acid as one of the products) were entirely or partially destroyed, and if the latter to what extent. Wishing to use a test for the presence of hydrocyanic acid in cherry-laurel water which would be less tedious than those generally used for the detection of small quantities of hydrocyanic acid, a weak solution of mercurous nitrate in dilute nitric acid was adopted, which in the presence of a cyanide gives a greyish brown precipitate, even in the presence of chlorides, bromides, iodides, or phosphates. The test is not so delicate as the Prussian blue and sulphocyanide tests, but is sufficiently so for the purpose to which it was applied; a sample of cherry-laurel water not giving a reaction with the mercurous nitrate solution would certainly not owe its efficacy to hydrocyanic acid. Although mineral acids render weak solutions of hydrocyanic acid more stable, no foreign acid was found in any of the samples examined. A very good test for the detection of sulphuric or hydrochloric acid in the presence of hydrocyanic acid is the addition of dilute solution of oxyacetate of lead to the suspected sample, when if no mineral acid be present the liquid remains clear, sulphuric or hydrochloric acid producing a precipitate.

Mr. UMNEY said Mr. Woodland had done good service in calling attention to cherry-laurel water. He thought it was high time it was expunged from the Pharmacopœia altogether. Those who

knew what an uncertain preparation cherry-laurel water was would discard it. It was introduced no doubt to satisfy a little contention between the Edinburgh and the Dublin physicians, when the 1864 Pharmacopœia was framed. The Dublin men used to colour theirs with tincture of lavender, and the Edinburgh men distilled without colouring, and in this form it had been retained in our British Pharmacopœia. He remembered that in February, 1869, he read a paper showing how uncertain was the distillate, when prepared from leaves of different ages, and when the leaves were freshly gathered or kept a few days, showing also that after some two or three months' keeping the quantity of prussic acid decreased to an enormous extent. His experience as a manufacturer told him that cherry-laurel water was very little required, and it was very difficult for British pharmacy to keep it in a uniform state. The French Codex prescribed that after it was distilled it was to be examined by the aid of a nitrate of silver solution, and brought to a suitable strength; but the British Pharmacopœia took no notice of anything of that sort. Altogether he thought the sooner they saw the last of it the better.

A vote of thanks was passed to Mr. Woodland for this communication.

The last paper read at this meeting was a—

REPORT ON THE STRENGTH AND PURITY OF ALKALINE SOLUTIONS OF POTASH AND AMMONIA AS MET WITH IN PHARMACY.

BY JOHN WOODLAND, F.L.S., F.C.S.

Having during laboratory practice frequently noticed the presence of impurities in both liquid and solid samples of caustic potash, I was (on seeing in the list of subjects for papers, issued by the Secretaries of this Conference, that information regarding the purity and strength of solutions of potash and ammonia is required) induced to examine a few samples in ordinary retail commerce, with the view of ascertaining if the same impurities exist in liquid potash, and as regards the chief ones to what extent, also to determine the strength and purity of liquid ammonia. The results of the examination of ten samples of liquid potash are as follows:—

No. of Solution.	Specific Gravity.	Percent- age of Alkali.	Percent- age of Chloride of Potas- sium.	Other Impurities.
1	1.06	5.91	.324	.3 per cent. of alumina, traces of calcium, sodium, silica, carbonates, and sulphates.
2	1.06	5.94	.238	Traces of alumina, lime, silica, and carbonates.
3	1.054	5.05	.123	Traces of alumina, lime, carbonates, and sulphates.
4	1.045	4.625	.104	.24 per cent. of alumina, .44 per cent. of lead oxide, traces of lime, silica, sodium, carbonates, and sulphates.
5	1.06	5.73	.273	5.2 per cent. carbonate of potash, traces of alumina, soda, and silica.
6	1.056	5.59	.114	.58 per cent of lead oxide, traces of alumina, lime, soda, and carbonates.
7	1.051	5.66	.165	Traces of alumina, lime, carbonates, and sulphates.
8	1.051	5.405	.26	.35 per cent. of alumina, traces of lime, carbonates, and sulphates.
9	1.052	5.412	.19	.28 per cent. of alumina, traces of lime, carbonates, and sulphates.
10	1.048	4.73	.224	Traces of alumina, lime, soda, silica, carbonates, and sulphates.
*11	1.046	4.095	.23	Traces of alumina, lime, silica, and carbonates.

From these experiments the average specific gravity is 1.0537, that of the B.P. solution being 1.058; the average percentage of alkali is 5.4052 or 24.917 grains in an ounce, the strength of a B.P. solution being 5.84 percentage of alkali, or 27 grains in an ounce, and the average percentage of chloride is .2015.

The presence of lead in two of the samples indicates want of care in storage. In nearly every case when purchasing the samples, I noticed that the solutions were poured from white (instead of, as the B.P. orders, green glass) bottles, and if I remember rightly (?) the two samples containing lead were poured from *new* white glass bottles recently labelled. Since performing the above experiments, I have tested two samples of liquid potash which have been kept in *old* white glass bottles for the space of from three to six months, and no trace of lead could be found in either; but on testing a sample that had been kept in a *new* white glass vehicle for three weeks, the presence of lead was very evident. Here I infer that during a certain time the silicate of this metal is being gradually

* This solution included with the others of potash was solution of caustic soda supplied in place of the former, which was asked for.

removed by the action of the alkali on the inner surface of the glass until no more is left; when the bottle is fit to contain the alkali without danger of its being contaminated. The test applied for the detection of alumina is based upon that used for the detection of alum in bread. An alkaline infusion of logwood in solution of ammonia is prepared (1 of logwood to 20 of the solution). After acidification of the liquid potash, this ammoniacal infusion is added in excess and the liquids heated, when if a trace of alumina be present a dark precipitate appears.

From experiments performed upon solutions of ammonia, both strong and dilute, it was found (as the following table will show) that they are as a rule free from salts of other metals, although the strength and specific gravity vary to a slight extent. Six samples of dilute solution of ammonia were obtained from retail pharmacies and yielded the following results:—

No. of Sample.	Specific Gravity.	Percentage of Ammonia Gas.	Impurities.
1	·958	10·01	Traces of sulphate and chloride.
2	·959	10	Traces of sulphate and chloride.
3	·961	9·75	Traces of sulphate.
4	·946	11·04	Traces of zinc, sulphates and chlorides.
5	·959	9·98	Traces of sulphate and chloride.
6	·956	10·23	Traces of sulphate and organic matter.

Five samples of strong solution of ammonia were examined with the following results:—

No. of Sample.	Specific Gravity.	Percentage of Ammonia Gas.	Impurities.
1	·888	34·02	Traces of chloride.
2	·884	36·3	Traces of organic matter and chloride.
3	·880	37·85	Traces of chloride and sulphur.
4	·892	32·2	Traces of sulphate.
5	·888	34·02	Traces of chloride.

The solutions containing organic matter gave a slight reddish brown colour with nitric, and a pink with sulphuric acid, showing the impurity to be of a tarry nature; but such small traces were present that volumetric estimation by permanganate of potash was not resorted to.

A vote of thanks was passed to Mr. Woodland for his paper.

CLOSING BUSINESS.

PLACE OF MEETING IN 1881.

The PRESIDENT said the next business was to settle the place of meeting for next year.

Professor ATTFIELD then read a letter from Mr. Ralph Davison, of York, giving a cordial invitation to the Conference, from the chemists of York, to meet in that city next year.

Mr. CLARK (York) said he had to apologise for the absence of Mr. Sowray, who intended to be present also as a delegate. He was present at the meeting referred to in the letter just read, when it was unanimously resolved to send an invitation to the Swansea meeting, and he also had an opportunity of seeing the chemists of York who were not able to be present at the meeting, and he was able to convey to the members the unanimous invitation of the York chemists. They could not offer to show any large manufactories, such as the members had been accustomed to see during the last two years; but they had one manufactory, that of glass bottles, which would be interesting because it was established by a retail chemist in York, Mr. Spence.

Professor ATTFIELD moved that the thanks of the meeting be given to the chemists of York for their cordial invitation, and that their offer be accepted. York had supported the Conference from its earliest days, and some members residing at York had always attended the meetings.

Mr. MASON seconded the motion, which was carried unanimously.

ELECTION OF OFFICERS.

Professor ATTFIELD said the Executive Committee had very carefully considered the question of what officers they would recommend for election for the ensuing year, and a printed list had been circulated showing the result of their deliberations. It was too late to explain many of the points which the Committee had considered, but he could assure the meeting that the names were the result of prolonged discussion; at the same time it was open to any of the members to suggest any alteration in the list.

The PRESIDENT then read the following names, who, on being put to the vote, were unanimously elected :—

President.

RICHARD REYNOLDS, F.C.S., Leeds.

Vice-Presidents.

Professor ATTFIELD, F.R.S., etc., London.

R. DAVISON, York.

N. M. GROSE, Swansea.

C. UMNEY, F.C.S., London.

Honorary Treasurer.

C. EGIN, F.C.S., London.

Honorary Secretaries.

F. BADEN BENDER, F.C.S., Manchester.

M. CARTEIGHE, F.C.S., London.

Honorary Local Secretary.

JOSEPH SOWRAY, Petergate, York.

Other Members of Executive Committee.

R. DRESSER, York.

T. GREENISH, F.C.S., London.

J. HUGHES, Swansea.

A. H. MASON, F.C.S., Liverpool.

S. PLOWMAN, F.I.C., London.

C. SYMES, Ph.D., Liverpool.

Professor TILDEN, F.R.S., etc., Birmingham.

J. C. THRESH, B.Sc., F.C.S., Buxton.

J. R. YOUNG, Edinburgh.

Auditors.

J. T. WILLIAMS, Swansea.

J. CLARK, York.

THANKS TO LOCAL COMMITTEE, ETC.

Mr. BRADY then moved—

“That the non-resident members of the British Pharmaceutical Conference hereby tender their cordial thanks to the Local Committee, and especially to Mr. N. M. Grose, Mr. J. Hughes, and Mr. J. T. Williams, for the admirable and successful manner in which their various arrangements connected with the Swansea meeting have been carried out.”

He said he need add no words of his own to the sentiment which was so well expressed in the resolution.

Mr. SAVAGE said the acclamation with which the resolution had been received was sufficient evidence of the satisfaction which had been given. He had attended a great many annual meetings, and though it would be invidious to make any comparison where all had tried to do their best, he might say that in no place had they met with a more cordial reception, or a greater desire to do the best they could for the interest of the Conference.

The resolution having been carried unanimously,

Mr. GROSE, on behalf of the Committee, said he tendered their most hearty thanks for the unanimous and hearty manner in which they had received the resolution just passed. He did not think it was required, for they had only done their duty as every Englishman and every Welshman would like to do. They felt honoured at having entertained so many eminent scientific luminaries of the day. Although the illustrious visitor who had been present for an hour or two from the other side of the Atlantic had left, still Swansea was proud that he had attended its Conference.

Mr. J. HUGHES said he could only endorse the sentiments of his friend and *confrère*, Mr. Grose, who had done so much to lighten his duties as Secretary.

Mr. PLOWMAN then moved a vote of thanks to Messrs. Vivian & Sons for their kindness in allowing the members to look over their copper works. He was sure he should express the feelings of all present when he said that the largest amount of instruction and entertainment was felt by all who visited the works.

Mr. ELLINOR seconded the motion, which was carried unanimously.

Mr. R. H. DAVIES then moved that the best thanks of the Conference be given to the proprietors of the Landore tin plate works for the facilities given to the members present of inspecting their works. He was sure those who went over these fine works were charmed alike with both. Every one seemed willing to give all the information in his power, and all arrangements appear to have been made to afford a full view in every department of each of these large works.

Mr. WARD seconded the motion, which was carried unanimously.

THANKS TO THE PRESIDENT.

Mr. CHIPPERFIELD proposed a hearty vote of thanks to the President for the very courteous and able manner in which he had conducted the business of the Conference. Mr. Southall, in occu-

pying that chair, had followed on in an illustrious line of ancestry, but he was quite sure they would all agree that the dignity of the office had not suffered at his hands. He could only express a hope that in years to come the chair would be filled as ably as it had been on that occasion. He had much pleasure in meeting their worthy President on that the seventeenth year of their history, and he could only express a hope that he might be spared to meet him on the thirty-fourth.

Mr. HUGHES, as a Welshman, begged to second the proposal, and to say a word or two of gratitude to those who had come to the Principality to enlighten them as to what they ought to do. He must crave permission to express his feelings in his native language. This he proceeded to do amidst great applause.

The resolution was then put by Mr. SCHACHT, and carried unanimously.

The PRESIDENT thanked the members very much for the kind manner in which the resolution had been proposed and carried. He had felt it to be a great honour to occupy the important position of President of the Conference, and trusted the Conference had not suffered by his presidency, and he would remind them that when he undertook the duty it was on the full understanding that it was for one year only, and he should be followed by a gentleman more fitting than himself, and who had been a mainstay of the Conference, and it would be a great pleasure to him to give up the office to his friend Mr. Reynolds.

The proceedings were brought to a termination by a presentation to Professor Attfield.

PRESENTATION

TO

PROFESSOR JOHN ATTFIELD, PH.D., F.R.S., F.I.C., F.C.S., ETC.

SWANSEA, August 25, 1880.

Mr. SCHACHT rose and said: Mr. President, a duty has come to me by the accident of things, the full responsibility of which I feel, but find I am able to endure because of the great personal gratification which accompanies it. It will be remembered that on the occasion of our meeting last year at Sheffield, it was announced by our Senior Honorary Secretary that it would be impossible for him

to fulfil any longer the duties appertaining to that office; and he merely yielded to our urgent solicitations to continue them for another year on the clear understanding that after this meeting his official connection with the Conference as its Honorary Secretary should terminate. The first emotion that possessed us when that announcement was made was one of dismay at the prospect of losing the services of so devoted and able an officer, but this was speedily absorbed by one of sincere gratitude for the good work Professor Attfield had done for us through so many years, and a resolution was at once adopted to offer him on the occasion of our next yearly gathering something that should publicly and palpably express that feeling. I had the honour then, sir, to occupy the place now so worthily filled by yourself, and hence the prominent part which I am now called upon to play in this matter. For many years I have had the pleasure of an intimate acquaintance with our friend, and charging my memory to strict accuracy, I can trace throughout all my knowledge of him nothing but one steady, constant effort to lead a good and useful life. As to its goodness, this is not, perhaps, the place to speak, and I will not dilate upon it further than to say that I believe that side of his character to be the mainspring of the other. But it may not be inappropriate, perhaps, to say just a word or two on the usefulness of Professor Attfield's public life, which is, indeed, the cause of what we are now doing, and explains the enthusiasm with which the project has been received. Broadly speaking, it appears to me that the usefulness of our friend's life has consisted in this, that he first of all achieved a high and distinguished position for himself, and from that moment has endeavoured to hold up both for our admiration and achievement that higher life of mental culture which is so plainly open to us in the very nature of our calling, but which we are so prone to forget amidst the pressure of business. It seems to me it has been in that constant protest against pharmacists sinking into anything like perfunctory drudges, and in his recommendation of the only genuine remedy for that, viz., that each man should do something, or at least try to do something, for the general good, that the main influence for good of Professor Attfield's life has rested. Beginning his pharmaceutical work somewhere about 1854, he carried away the only medals which the school then offered its patient and industrious students; he took both the first prizes in his year, and soon after became director of the laboratory, and finally, Professor of Practical Chemistry. Throughout the time he has held this appointment his usefulness and success

in that capacity can be testified to by scores of our most eminent pharmacists, and the secret of his success seems to have been that he has adopted the scientific method of teaching his own science, steadily avoiding all those apparently royal roads which commend themselves to some to their own delusion, and constantly advocating that one steady course through the narrow way that leads to right. And for this, not pharmacists only, but the whole public, ought to feel, so far as they know the facts, something like gratitude. But possibly the most interesting point in our friend's career was that at which he allowed himself to become the chief Honorary Secretary of this Conference. He, I am sure, would not wish me to attribute the whole success of this organization to his labours. He was associated in those days with men who have always been found faithful to the cause of Pharmaceutical progress, some of whom I see around me now, whilst some of them have gone to their rest. All were earnest in their endeavours to promote an organization which was aiming, as they thought and as he thought, at advancing the highest interests of pharmacy. They all laboured earnestly, but I know that those gentlemen, and all who laboured with them, would wish me to say that they regard Professor Attfield's labours as the most prominent, and that they would accord to him a very large portion of the honour due to those who carried the infant through its early days into maturity. The project of this presentation was initiated a year ago, and during the interval I am happy to remind you that Professor Attfield has received perhaps the highest reward which a scientific Englishman of the present day can seek. He has received the blue ribbon of science in being elected a Fellow of the Royal Society. I think, however, it will be gratifying to you all to remember that this testimonial was initiated before the recognition of Professor Attfield's claims to scientific distinction on the part of the governing body of the Royal Society. But probably you will all feel glad when my weak words are ended; I will, therefore, detain you no longer than to read this scroll which is to accompany the presentation of some volumes of general literature. These are at present in London, where an opportunity may perhaps be afforded those who feel curious to see them to do so during the next few weeks, as they are too bulky to be brought down here:—"Presented, with about five hundred volumes of general literature, to John Attfield, Ph.D., F.R.S., Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain, etc., by Members of the British Pharmaceutical Conference, in token of their goodwill and hearty

appreciation of his services as Senior Honorary Secretary of the Conference from its foundation at Newcastle-on-Tyne in 1863 to its meeting at Swansea in 1880." That is signed by myself as Chairman, F. B. Bengier, Henry B. Brady, T. Hyde Hills, Theophilus Redwood, Richard Reynolds, and Michael Carteighe, Honorary Secretary, representing, as the "Testimonial Committee," the very large number of members who contributed to the memorial. I beg, with your permission, sir, to hand it to Professor Attfield.

Professor Attfield, as soon as the cheering had subsided, rose and said :—Mr. President, Mr. Schacht, and gentlemen, I accept your very handsome testimonial with feelings of pleasure and of satisfaction which are simply inexpressible. As you have heard, seventeen years of the prime of my life have been devoted—shoulder to shoulder with such honoured colleagues as Reynolds, and Brady, and Schacht, with Presidents who still gladden us with their presence, and Presidents who have passed away—to the founding, developing, and maintaining of the British Pharmaceutical Conference. My great reward—the greatest reward, as a matter of course—is seen in the grand success of our joint labours. That success is unquestionable. We have, officers and members together, during the seventeen years of the life of the Pharmaceutical Conference, contributed to the stock of pharmaceutical knowledge four hundred original investigations, and we have done that without impoverishing in the slightest degree any other agency for the prosecution of original research. We have annually given opportunities for the leading chemists and druggists of Great Britain and Ireland to assemble together and exchange thoughts and opinions on pharmaceutical matters, and, by the generous aid of the local members in the towns visited, we have given them ample opportunities for friendly intercourse and good-fellowship; and these things have had the happiest results. And lastly, for the past ten years we have given to every one of our 2000 or 2,500 members, not only the ordinary advantages of membership in a great association, but a record of the pharmaceutical discoveries made throughout the whole world, in the form of a "Year-Book," which itself has been, I think, at least of double the value of the annual subscription. I say again, my greatest reward is in contemplating the results of these, our joint labours. But, gentleman, to have one's life work appreciated and recognised by those for whom it has been more immediately undertaken and continued is extremely gratifying, and, therefore, I thank you from the depths of my consciousness for this most delightful present.

Gentlemen, my wife will thank you. And my children will thank you too; for they are just entering on the paths of general literature, and my library, although fairly well reflecting chemistry and the kindred sciences, much needs enriching in such works as those you now present to me. I myself, at the age of fourteen, or a few weeks over, went from my school books straight to the study of manuals of chemistry, botany, pharmacy, and materia medica; but, like Enoch Arden, I have ever desired that my children should have even a better bringing up. And as for my wife, of whom I am sure I may say, "many daughters have done virtuously, but thou excellest them all," I have long determined that she, now that the cares of teaching and training are getting less, should have the opportunity of having at command the works of those authors with whom a busy life (busy as mine) has only allowed of her having a partial acquaintance. You, by this present you now make me, enable me to realize some of my most cherished hopes. Gentlemen, I can only say that you could not possibly have gratified me and my family more than by publicly recognising this work that I have done, the loving labour that I have undergone for you and for pharmacy, and you could not possibly have chosen a better mode of showing your appreciation.

Loud applause greeted the conclusion of the above brief but very effective speech, and the proceedings terminated with three cheers for Professor Attfield.—*Pharmaceutical Journal*.

THE EXCURSION.

On Thursday, Aug. 26th, those pharmacists who bestirred themselves sufficiently early, and could, unaided by the spectroscope, descry the sun through the sulphurous mist that invariably overhangs Landore, east of Swansea, were unanimous in deciding that although the Local Committee in its wisdom had abandoned the idea of an excursion by water, still there was every prospect that more or less of that fluid might persist in accompanying them and their friends. These forebodings, however, deterred but few, and the members, accompanied by many of the fairer sex, made a start at 11 from the Royal Institution. Coaching westward through the town, and passing the pretty villa residences that line the road, they soon fancied themselves away from the devastating effects of copper smoke. Within a quarter of an hour a full view of the Mumbles was obtained, passing through Sketty Village, where

abundance of honeysuckle skirted the road. A view of the bay was followed in quick succession by the pretty valley in which is the railway station of Killay. No sooner, however, was an attempt made to cross Fairwood Moor than the rain descended in such quantity as to obscure the clear-sighted vision of the guide, Mr. Grose, and to effectually prevent him from pointing out the grouse in the surrounding heather. Nothing daunted, the journey was continued; the old castles of Kilvrough and Pennard were passed, and upon reaching Penmaen the sun once more shone, and the rain disappeared for the day. From the coach road a fine view was obtained of Three Cliff Bay, Cefyn Bryn and Oxwich Burrows. Penrice Castle, the seat of Mr. Talbot, M.P., was reached about two, and the excellent enrichments of the mosaic mantelpieces and the pictures were much admired. Here the botanists enjoyed their favourite pursuit, and found during their ramble through the park to Oxwich beach *Origanum vulgare*, *Lappa minor*, *Centranthus ruber*, *Mentha rotundifolia*, *Campanula Trachelium*, *Enanthe crocata*, *Cichorium Intybus*, *Epilobium hirsutum*, *Menyanthes trifoliata*, etc.

Through the kindness of the Rev. Mr. Jenkins, Vicar of St. John's, luncheon was served on his lawn, and his church on the edge of the beach was visited by many. The parties here divided, the ladies coaching, others walking for a mile or two along the beautiful sandy beach, while the more robust wended their way through the woods. All, however, arrived at the Gower Union House, which had been kindly placed at the disposal of the Committee by the guardians, and here the whole party appreciated a very excellent "high tea" and indulged in humorous speeches, some in Welsh, complimentary of Messrs. Hughes and Grose, and other local friends. At dusk the excursionists retraced their way, and arrived safely at Swansea soon after ten o'clock, much pleased with their trip.

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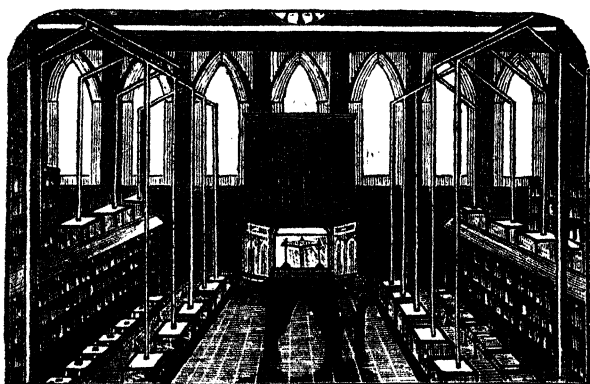
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EXHIBITION OF SODA-WATER MACHINERY AND APPLIANCES held in the HOLBORN TOWN HALL, LONDON, October, 1880.

"Mr. WILLIAM HAY, of 4, REGENT'S TERRACE, ANLABY ROAD, HULL, made a large and comprehensive display of his excellent Ginger Ale Essences, known as Hay's Soluble Essence of Jamaica Ginger, 'The Compound Essence,' The Compound Fortified Essence, and Ginger Ale Extract. Little more can be said in praise of these excellent preparations than what has already appeared in the leading scientific, medical, and trade journals printed in this country, the Colonies, and the United States of America. Their praises have resounded through almost every existing mineral water manufactory where the English tongue is spoken, or where a demand for such essences and extracts as made by Mr. W. HAY is experienced. The aerated drinks manufactured with these Essences are of such a superior character, that they must eventually elevate the public taste for non-intoxicating drinks, but which, at the same time, act as grateful tonics to the stomach."
—*Mineral Water Trade Recorder, London, November 1st, 1880.*

**Prepared by W. HAY, Manufacturing Chemist,
4, REGENT'S TERRACE, ANLABY ROAD, HULL.**

GOLD MEDAL, PARIS EXHIBITION, 1878,

AWARDED TO

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SALTS OF MORPHIA, PURE CHLOROFORM,

SALICINE, Etc.

MIST. PEPSINÆ Co. c̄. BISMUTHO,

A USEFUL COMPOUND, CONTAINING

Pepsine, Nux Vomica, Opium, Hydrocyanic Acid, Chloric Æther, and Bismuth, &c.

DOSE.—Half to One dram diluted.

"Provident Dispensary, 15, Stanhope Street, Newcastle-on-Tyne,
March 7th, 1880.

SIR,

I must thank you for having put me in possession of a most useful and elegant preparation, in the shape of your Mist. Pepsinæ Co. c. Bismutho.

In that most extensive class of cases met with in general practice, including Dyspepsia, Gastrodynia, Pyrosis, etc., I know of no remedy which acts so readily and efficiently as the above preparation. Another, by no means slight advantage in your happy combination, is the rapidity with which it can be dispensed, and its solubility in various media.

I am convinced that it only requires to be known to be extensively used.

Yours truly,

JOHN H. M. GALLWEY, M.R.C.S.E."

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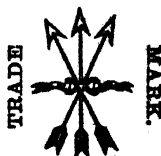
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PHARMACEUTICAL CHEMISTS will use this in preference to the ZINCI OXIDUM of the Br. Ph. 1867, which is a return to the process of the Pharmacopœia of 1836, being a roasted Carbonate as a substitute for the pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain upwards of 99 per cent. of Pure Oxide; in fact, the impurities are not traceable.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON,
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine."

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited had been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

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BRITISH PHARMACOPŒIA,
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 A Price Current and Sample post free.

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Smelling Salts.—The MONOCARBONATE OF AMMONIA manufactured by ALFRED ALLCHIN is the Neutral Salt so much valued for the preparation of Smelling Salts. It retains its pungency as long as any salt remains. 1 lb. bottles, 2s. 8d. each.

Liq. Ammon. Odorif., or VOLATILE ESS.: for Allehin's Ammon. Monocarb. In stoppered bottles, 4 oz., at 1s. 8d.; 8 oz., 3s. each.

Pungents, with handsome Cut Stoppers, filled with Allechin's Smelling Salts, 8s. per dozen.

Ol. Rosæ Concent.—One ounce of this Concentrated Solution of Anchusine, mixed with two pounds of Oil, will give it the usual colour; it is also admirably adapted for colouring Pomades, Lip-Salve, Camphor Balls, etc. 4s. per lb.

Ol. Flav. Conc.—One ounce, added to two pounds of Pomade, will give the usual golden colour, which is permanent. 4s. per lb.

To be had of all the Wholesale Houses.

BULLOCK'S PEPSINA PORCI.

Dose, 2 to 4 grains.

The experiments of Drs. Pavy, Sieveking, and Professor Tusson demonstrated that the Pepsine manufactured by BULLOCK & Co. (Dr. Beale's process) possessed far greater digestive power than that of any known maker, either English or Continental.

In Small Bottles for Retail, and in Bulk.

BULLOCK'S ACID GLYCERINE OF PEPSINE.

This preparation may be prescribed, in the form of mixture, with most substances compatible with acids.

G. F. DOWDESWELL, Esq., B.A., (Cantab.) F.C.S., F.L.S., etc., in a paper contributed to the *Practitioner*, March, 1880, on "Medicinal Pepsine and Artificial Digestion," states:—"That after more than 20 experiments, he found the Pepsina Porci and Acid Glycerine of Pepsine of Bullock & Co. possessed far greater digestive power than any other Pepsine or form of Pepsine, English, French, German, or American, and that many specimens examined by him were practically inert."

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In 4-oz., 8-oz., and 16-oz. Bottles, and in Bulk.

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 PEPSINE AND CHARCOAL LOZENGES.

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plain (Ext. Malti Pharm. Germ.)	...	2	6
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with Pyrophosphate of Iron	2	9
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with Hypophosphite of Lime	2	9
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Mr. Loeßlund, in the Manufacture of his Extract, follows the special directions of Baron Liebig, who personally proposed to him as early as 1866 the production of this Dietetic, the superiority of which has since been recognised by First-Class Medals awarded at the Exhibitions of Paris, 1867; Moscow, 1872; Vienna, 1873; Philadelphia, 1876, etc.

Loeßlund's Extract, in preference to many others, is not subject to fermentation or deterioration in any climate.

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"Commended for the manufacture of these products on scientific principles."—Dr. VON WAGNER.

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Prices Current on Application.

BENGER'S PREPARATIONS OF THE NATURAL DIGESTIVE FERMENTS.

LIQUOR PANCREATICUS (Benger), REGISTERED.—Containing the proteolytic and diastatic ferments of the fresh pancreas. It is capable of converting proteids into peptones, and starch into sugar, with wonderful rapidity. These properties have caused it to be largely used for the preparation of peptonised or partially digested foods, such as milk, gruels, soups, beef-tea, etc.; and the administration of foods thus rendered fit for immediate absorption has been attended with great success in the treatment of various diseases.

LIQUOR PEPTICUS (Benger).—An exceedingly active preparation of the natural digestive principles of the stomach. It is prescribed in doses of one to two teaspoonfuls (with or without ten minims of dilute hydrochloric acid) in half a wineglass of water, to be taken with or immediately after meals, especially those meals which include meat or eggs.

The *Lancet* of August 7th, 1880, referring to these preparations, says:—"These are carefully prepared and, so far as we can tell from the tests we have been able to use, thoroughly trustworthy preparations. So many worthless articles of this kind have been sold that great care is required in choosing those upon which reliance can be placed. Mr. Benger's care has therefore been well spent."

From "THE LUMLEIAN LECTURES on the Digestive Ferments, and the Preparation and Use of Artificially Digested Food," recently delivered before the Royal College of Physicians, London,

of the manufacture, and has produced an extract which possesses the diastatic and proteolytic properties of the pancreas in a highly concentrated degree. It is a nearly colourless solution, with very little taste or smell.—It is of this preparation that I must be understood to speak in what I have now to say on the production of artificially digested food by pancreatic extracts."

From Dr. W. ROBERTS' address at the NORTHWICH MEETING of the BRITISH MEDICAL ASSOCIATION.—"Those of you who from past experience have lost faith in Pepsine may be encouraged to try again the more active preparations which are now within our reach. A *Liquor Pepsinae* (*Liquor Pepticus*, Benger), prepared by Mr. Benger, is a digestive agent of extraordinary power."

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MACKEY'S QUINQUININE.—A most valuable tonic and antiperiodic. Dose as Quinine. Takes the place of Sulphate of Quinine, at less than half the price. May be obtained from the Makers or through any of the Wholesale Houses, in 1-oz. bottles, 5s. 6d., and in 4-oz. bottles and 25-oz. tins. For protection, every genuine bottle and package bears the label of MACKEY, MACKEY & Co. It is of great value for exportation to India, China, the West Indies, etc.

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MACKEY'S MISTURA BISMUTHI COMP.—Contains Bismuth in its most effective form, combined with Chloroform, Nux Vomica, Hydrocyanic Acid, and with or without Morphia. A valuable medicine for various forms of Indigestion, and any disorder of Stomach arising from irregular living, in Pyrosis, and soothing the symptoms of internal malignant diseases, and for Infantile Diarrhoea. The *Lancet* says: "Bismuth could hardly be given in a better form."

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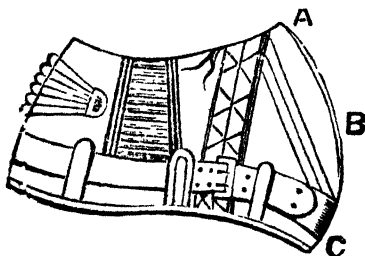
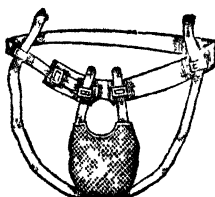
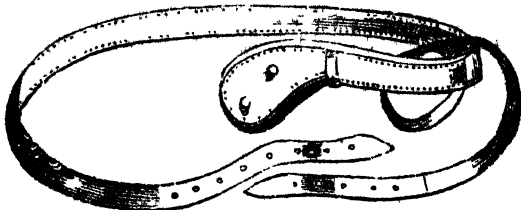
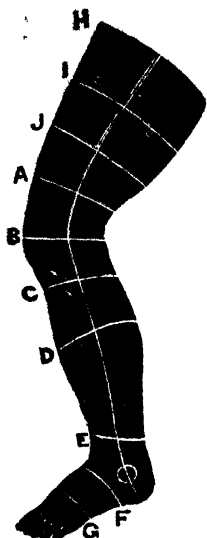
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"PRINCESS ALICE" CALAMITY.—The Sanitary Fluid was used at the Woolwich Dock-
yard for Disinfecting over 600 Bodies. The Clothing taken from the Bodies and over 500
Sheets were also Disinfected in large Cauldrons; also the Building, Yards, etc., giving the
greatest satisfaction to the Dockyard and Parish Authorities. The work was carried out
under the superintendence of Mr. HARMER.

TESTIMONIAL.—"H.M. Dockyard, Woolwich, September 23, 1878. SIR,—I beg to inform
you that I consider your Disinfectant, as applied in the Dockyard, both to buildings and
clothing after the removal of the dead from the premises, very efficacious, and, from its
cleanliness and absence of smell, very superior to the Disinfectants in the form of powder
generally used.—Faithfully yours, J. T. BARRINGTON, Assistant Commissary-General. Mr.
Harmer, Stratford, E."

The Analyst, May, 1879, edited by Dr W. G. WIGNER, F.C.S., and Dr. J. MYERS, M.A.,
F.C.S., Public Analysts, says of the Sanitary Fluid:—"Two experiments on samples of
urine gave satisfactory results, as putrefaction was retarded for several days longer than
in similar samples treated with carbolic solution."

For Asylums, Schools, Sanitary Authorities, Railway and Dock Companies, Workhouses,
Shipping, Stables, Cowhouses, Cattle in transport, etc. Price 1s. per bottle; 3s. 6d. per
gallon; large quantities at a cheaper rate, of the Sole Manufacturer, W. J. HARMER,
Chemical Compound Manufacturer, West Ham Lane, Stratford, E., or through Agents.

The MAGIC FLUID, for General Household Purposes, price 1s. 6d. per gallon. Write for
Pamphlet, with Testimonials, etc.

ELLIMAN'S

FOR
HORSES
AND CATTLE
MANUFACTORY
SLOUGH
ENGLAND



SOLD
EVERYWHERE

In Bottles

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STEINHELIS'
"APLANATISCHE LOUPEN."

NEW COMBINED ACHROMATIC TRIPLET MAGNIFYING LENSES
 MOUNTED FOR THE POCKET.

These Lenses are constructed so as to be used at a great focal distance from the object, and they give marvellous definition over the whole field. Linear magnifying powers $\frac{1}{4}$, 3, 12, 16, and 24 times. Price 18s. for first-mentioned power, and 15s. each the four last.

Note.—For all microscopic examinations they are found to be the most perfect Pocket Lenses extant.

SOLE AGENTS:—

MURRAY & HEATH,

Manufacturers of Microscopes and Medical Apparatus,
 69, JERMYN STREET, LONDON, S.W.

THE "DESIDERATUM"
MIXING MACHINE.

BRACHER'S PATENT.

TESTIMONIALS AND PARTICULARS

ON APPLICATION TO THE MANUFACTURERS,

P. H. BRACHER, & Co., 77, High Street, Wincanton.

SPECIAL NOTICE.

Glass Show Jars, Unequalled for Style, Quality and Price.

W. J. LEMAITRE & CO.,
 SHOP FITTERS,
 CASE MAKERS, AND WRITERS,
 66, PENTONVILLE ROAD, LONDON, N.

Plans and Prices of Modern Chemists' Shops in any Style Free by Post.

SHOP FITTINGS & FIXTURES

OF THE BEST MANUFACTURE.

Druggists' Sundriesmen, Wholesale Druggists, and the Trade supplied
 on the most advantageous terms.

PLANS AND ESTIMATES SUPPLIED.

EXPERIENCED WORKMEN SENT TO ALL PARTS OF THE UNITED KINGDOM.

TRENT BROTHERS,
 9 & 11, BAKER'S ROW, LONDON, E.

MEDICAL SHOP FITTINGS,

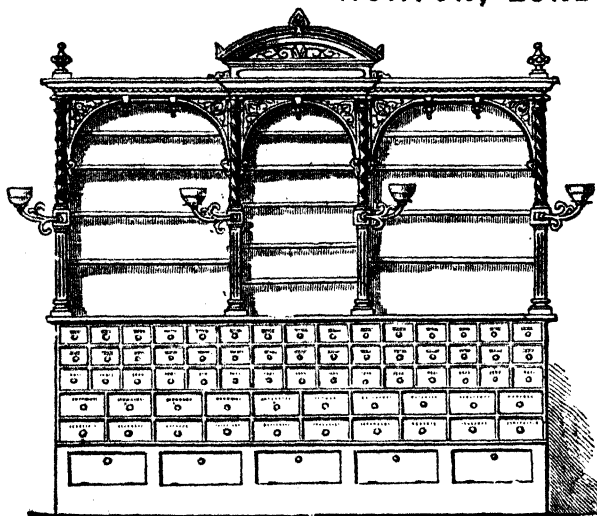
MANUFACTURED BY
GEORGE TREBLE & SON.

72, 74, 76, 78 & 80, Crondall Street.
(LATE GLOUCESTER STREET.)

25, Myrtle Street,
44, 46, 48, 50 & 52, Whitmore Road,
AND
Bridge Wharf, Regent's Canal.

Office:

78, Crondall Street,
HOXTON, LONDON.



Design for Drawers and Shelves for side of Shop.

If New Fittings are required or alterations become necessary, apply to GEO. TREBLE & SON, whose Travellers will call to take instructions and measurements in any part of the kingdom, and will prepare suitable designs and estimates free.

CHEMISTS' SHOPS FITTED UP BY CONTRACT IN ANY PART
OF THE KINGDOM.

(Estab.)

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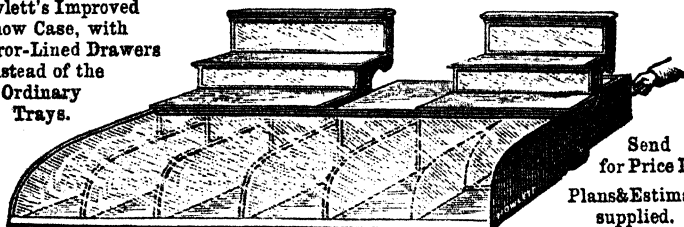
(1830).

Medical Shop Fitter and Shop Front Builder,

AND

GLASS SHOW CASE MAKER.**MEDICAL LABELLING AND WRITING ON GLASS, ETC., ETC.****Cabinet Fitter to the Pharmaceutical Society of Great Britain.**

Howlett's Improved
Show Case, with
Mirror-Lined Drawers
instead of the
Ordinary
Trays.



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for Price List.
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supplied.

MANUFACTORY AND SHOW ROOMS:

LINDLEY STREET, SIDNEY STREET, MILE END, LONDON, E.

GREAT SAVING
OF MONEY AND
LABOUR.

SOMETHING NEW.

ELEGANCE
AND DURABILITY
COMBINED.

PATENT RECESS LABELLED SHOP ROUNDS.

Parties about to Open New Establishments or Refit Old Premises should compare following
Net Prices.

**THESE PRICES INCLUDE GLASS LABELS ATTACHED TO BOTTLES
READY FOR USE.**

FLINT GLASS. BLUE GLASS.

Size. Height. N.M. W.M. N.M. W.M.
16 oz. 8 inch. 16 6 18/6 20/- 22/- per doz.
20 „ 9 „ 17/6 20/- 21/- 23/- „

FLINT GLASS. BLUE GLASS.

Size. Height. N.M. W.M. N.M. W.M.
32 oz. 10 1/2 inch. 20/- 22/- 26 6 per doz.
42 „ 11 „ 22/- 26/6 26/6 30/- „

Prices of other Shop Bottles, etc., on application. Sample Bottle sent on receipt of 1s. 7d. in stamps.
Fac-Simile sheet Labels, in various styles, sent on receipt of two stamps.

Amongst others, the following parties have recently been supplied with
these Bottles:—

Bradford, Dr., Carlisle.
Brunton, W. W., South Kensington, London.
Campbell, Dr., Oban.
Carruthers & Allan, Dumfries.
Cullen & Co., South Norwood, London.
Cummings Bros., Dundee.
Cunningham, Dr., Campbeltown.
Edwards, G., Stockport Road, Manchester.
Forwell, H., Helensburgh.
Fraser Bros., Helmsdale.
Hume, R., Glasgow.
Irvine, Dr., Pitlochry.
Kinnimount, A., Glasgow.
Le Brocq, P. D., Jersey.

Lonsdale, A. W., Rangoon, Burmah.
Mason, W. D., Grimsby.
McJannet, Dr., Lennoxtown.
McKirdy, J., Rothsay.
Noble, A., Galashiels.
Pattison, H., Colcham, Shrewsbury.
Reid, Dr., Aberfeldy.
Senior, Harold, Norwood Lane, London, S.E.
Sibthorpe, S., Wolverhampton.
Smith, Albert, Ilfracombe.
Taaf, H., Londonderry.
Taylor, W. G., Hungerford.
Waterhouse, A., Huddersfield.

SOLE AGENTS:—

GLASGOW APOTHECARIES' COMPANY, Virginia St., Glasgow.

MEDICAL SHOP FITTINGS,

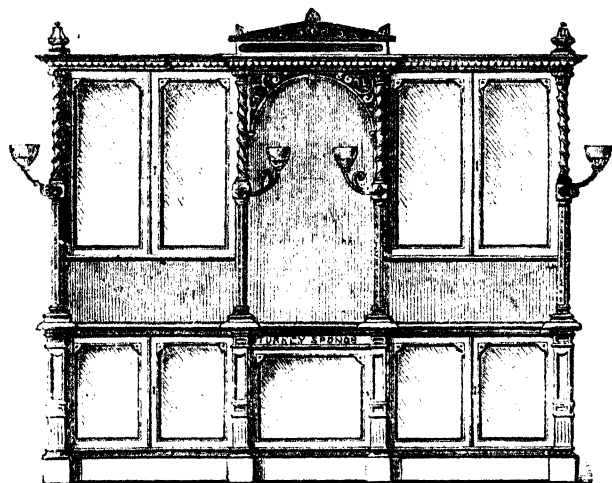
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72, 74, 76, 78 & 80, Crondall Street.
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25, Myrtle Street,
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Bridge Wharf, Regent's Canal.

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78, Crondall Street,
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Design for Upright Wall Case for side of Shop.

If New Fittings are required or alterations become necessary, apply to GEO. TREBLE & SON, whose Travellers will call to take instructions and measurements in any part of the kingdom, and will prepare suitable designs and estimates free.

CHEMISTS' SHOPS FITTED UP BY CONTRACT IN ANY PART
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ROBINSON & SONS,

MANUFACTURERS OF

Round, Square, Oval, and Octagon
Paper and Willow Boxes.

WHEAT BRIDGE MILLS.

Near **CHESTERFIELD.**

WAREHOUSE: 55, FANN STREET,
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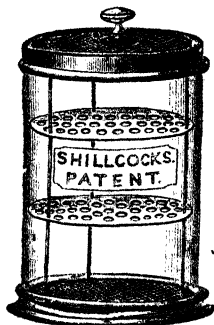
*Honourable Mention for Cardboard
Boxes, 1862.*

FOR CLEANING PLATE.

BRADLEY & BOURDAS'S

Albatum or White Rouge, for Cleaning Gold, Silver, and Plated Goods.

Since its introduction as a substitute for the ordinary Rouge, a quarter of a century ago, the sale has amazingly increased both at home and abroad. A trial is only needed to prove its superiority over other Plate Powders in use. Sold in Boxes at 1s. and 2s.; Tins, 6s.—, Pont Street, Belgrave Square, and 48, Belgrave Road, London, S.W.



SHILLCOCK'S PATENT LEECH VASE

Is now fitted with Earthenware as well as Metal Plates; both supplied at the same charges; viz., for 100 Leeches, 22/-; 50, 16/6; 25, 13/-.

Wholesale Agents—

Maw, Son & Thompson, and the Wholesale Houses.

"LEWISHAM, S.E., April 9th, 1869.

"Mr. J. B. SHILLCOCK.—SIR,—I have had one of your Leech Vases in use for several months, and am very much pleased with it, as it keeps the Leeches healthy, and I rarely find a dead one.

"Yours, etc., C. W. REED."

**SKINS AND TINFOIL VEGETABLE
PARCHMENT.**

H. ERHARDT & Co.,
9, Bond Court, Walbrook,
LONDON, E.C.

Specially prepared for
tying over Jams, Jellies,
Marmalade, Drugs, Chem-
icals; for Capping Bottles
of Perfumes, Medicines,
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Packing and Covering
Greasy Articles, etc., etc.

ALSO
**WHITE SPLITS,
PLASTER,
CHAMOIS,
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AND
FRENCH SKINS,
TINFOIL & TINFOIL PAPER.**

Samples Post Free.

GLASS BOTTLES.

MEDICAL, DISPENSING, AND OTHER KINDS.

KILNER BROTHERS,

**No. 21, GREAT NORTHERN GOODS STATION
KING'S CROSS, LONDON, N.**

Illustrated Price Lists on application.

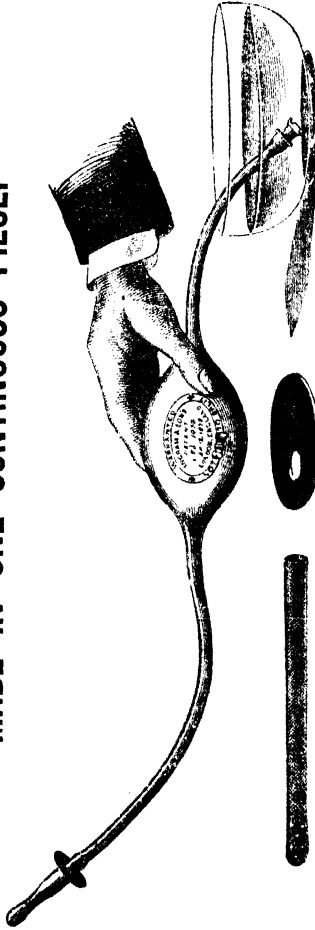
PRIZE MEDALS—LONDON, 1862; PARIS, 1875; PHILADELPHIA, 1876; PARIS, 1878; SYDNEY 1879.

INGRAM'S IMPROVED ENEMA APPARATUS.

BY ROYAL LETTERS PATENT.

SEAMLESS.—WARRANTED NOT TO SPLIT.

MADE IN ONE CONTINUOUS PIECE.



The following are the advantages claimed for our invention:—

- 1st. A Complete Enema and Syringe Apparatus without any metallic connections and wire fastenings whatever, thereby avoiding the possibility of leakage.
- 2nd. Specially prepared to resist the heat in tropical countries.
- 3rd. A perfect Apparatus, will not split, become hard or sticky.

Patented in America, No. 212,939, March 4th, 1879, and in France, No. 126,909, October 11th, 1878.

To be obtained of all Druggists' Sundriesmen, and Surgical Instrument Makers.



All bearing this Trade Mark
warranted Pure.

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ROBINSON & SONS,
Spinners and Manufacturers,
Cotton and Flax Lints, Carded Cotton
Wools and Bandages.
WHEAT BRIDGE MILLS,
NEAR CHESTERFIELD.

WAREHOUSE: 55, FANN STREET, ALDERSGATE
STREET, LONDON.

Chemists wishing to supply Infirmaries or Prison
and Workhouse Hospitals, should write for
Samples and Prices.

To be had of all the Wholesale Houses, or direct from
the Makers.

GREENSILL'S ORIGINAL MONA BOUQUET.

The Sweetest Perfume in the World.

REGISTERED TRADE MARK—TOWER OF REFUGE, DOUGLAS BAY.

AGENTS:—*Leeds*: Hirst, Brooke & Hirst; Goodall & Backhouse. *York*:
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Co.; Wm. Mather; Wm. Edwards; Sanger & Sons; R. Hovenden & Sons.
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chester: Jewsbury & Brown; J. Woolley & Co.; Mottershead & Co.; Lynch &
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PREPARED BY THE ORIGINAL INVENTOR OF THE TRUE MONA BOUQUET—

T. S. GREENSILL, DOUGLAS, ISLE OF MAN.

MATTHEWS'S WAXED PAPERS,

For covering Cold Cream, Ointments, Plaisters, etc.,
wrapping Jujubes, Scented Soaps, Violet Powder,
Linseed Meal, Horse Balls, and other greasy, per-
fumed, or adhesive substances, without any of the
objectionable results of using tin foil, and

AT HALF THE COST.

	Per box of 50 Sq. Ft.	Per Ream.
White	2s. 0d.	30s. 0d.
Various tints	2s. 6d.	32s. 6d.
Pink	2s. 6d.	36s. 0d.
Blue	2s. 6d.	32s. 6d.
Green	2s. 6d.	32s. 6d.
Yellow	2s. 6d.	32s. 6d.
Golden	2s. 6d.	34s. 0d.
Black	3s. 0d.	40s. 0d.

PREPARED BY

ROUSE & Co., 12, Wigmore Street, London.

And Sold by all Dealers in Sundries.



GOLD MEDAL,
PARIS,
1867.



AND AT
PHILADELPHIA, TRADE
1876.



E. H. THIELLAY'S
EAU FONTAINE DE JOUVENCE, GOLDEN;
OR, GOLDEN HAIR FLUID.

For rapidly changing Dark Hair into Flaxen or Sunny Shades.

Wholesale at 20 - 28 - 36 - 48 - 72 - 90 - per dozen.

Retail at 3 - 4 6 5 6 7 8 10 6 14 - per bottle.

A very Remunerative Article.

ALSO

EAU FONTAINE DE JOUVENCE
IN EVERY SHADE.

AUBURN.

BROWN.

RESTORER.

DARK.

BLACK.

PROGRESSIVE.

WHOLESALE DESCRIPTIVE PRICE LIST ON APPLICATION.

EUCALYPTIA.

MOSQUETAIRE.

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SHIPBOURNE.

BOUQUET.

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E. H. THIELLAY, Parfumeur-Chimiste,
CHARING CROSS HOTEL, LONDON.

EXPORT MANUFACTORY AT NEW CROSS, KENT.

BONDED WAREHOUSE AT RED LION WHARF.

Shippers and Merchants supplied on the usual Terms, and at a
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EUGENE RIMMEL, Perfumer to H.R.H. the Princess of Wales.

Meadow Flowers, Jockey Club, Ess. Bouquet, New Mown Hay, Ithlang-Ithlang, and other choice perfumes for the handkerchief.

Toilet Vinegar of world-wide celebrity.

Toilet Water, Lavender Water.

Florida Water, Eau de Cologne.

Lime Juice and Glycerine, the best preparation for the Hair.

Philocome, Australian Hair Wash.

Windsor, Glycerine, Honey, Transparent Coal Tar, and other Soaps.

Violet and Rice Powder. Velvetine. a superior imperceptible toilet powder.

Rimmel's Lotion for the complexion.

Aquadentine, a fragrant floral extract for cleansing and whitening the teeth.

Aromatic Ozonizer, a fragrant powder, producing by simple evaporation the healthy emanations of the Pine and Eucalyptus.

Fancy Crackers, Scent Cases Christmas Cards, Sachets, Valentines, etc.



Toilet Waters and Perfumes Shipped in Bond at a great reduction.

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SOLE PROPRIETOR AND MAKER OF THE

PREPARED SILVERY WHITE GUTTA PERCHA ENAMEL,
For Stopping Decayed Teeth.

REGISTERED—NO. 3745.

SILVERY WHITE GUTTA PERCHA ENAMEL.—36 squares in a box, to retail at 1d. each; wholesale price, 1s. per box.

SILVERY WHITE GUTTA PERCHA ENAMEL.—On show cards of $\frac{1}{2}$ gross, to retail at 1d., at 6s. per gross.

SILVERY WHITE GUTTA PERCHA ENAMEL.—12 sticks in a glass-lid box, to retail at 3d.; wholesale price, 1s. 3d. per box.

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SILVERY WHITE GUTTA PERCHA ENAMEL.—In 1-oz. sheet, 12s. per doz.

SILVERY WHITE GUTTA PERCHA ENAMEL.—In 4-oz. sheet, 3s. 6d. each.

P. A. S. can supply the above to Wholesale Houses, in any quantity, with their name stamped upon each piece, cut in sticks any length.

The above to be obtained of all Wholesale Houses. **Price List and Samples sent post free.**

SPECIAL NOTICE.—The words **SILVERY WHITE GUTTA PERCHA ENAMEL** are registered as a Trade Mark, and will be protected.

MESSRS. STONE & DOMINY, Dentists and Manufacturers,

35 & 48, ST. MARTIN'S LANE, LONDON, W.C.,

Execute Mechanical work, Teeth plate and materials inclusive, at per Tooth, 2s. 6d. Their connection personally requiring the services of a Dentist is treated as Professional, and charged Mechanical prices.

The Mechanical Department and Manufactory is at 48, and the Operative and Surgical Dentistry more especially at 35, under Mr. DOMINY.

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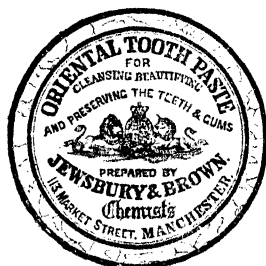
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HOPGOOD & CO.'S N. & S. HAIR CREAM.

Sold by Chemists and Perfumers, in Bottles at 1s. 6d., 2s., 2s. 6d., 3s. 6d., 5s., and 11s., each.

HOPGOOD & CO.'S SEDATIVE COLD CREAM, 6d., 1s., and 2s. 6d.

JEWSBURY & BROWN'S ORIENTAL TOOTH PASTE



ENSURES, BY ITS USE,
WHITE & SOUND TEETH.

Established 50 years as the most agreeable and effectual preservative for the Teeth and Gums.

OBSERVE this Trade Mark
on the Label round each
Pot.



Sold universally by Chemists and Perfumers.

1s. 6d. and 2s. 6d. per pot.

AMERICAN BAY RUM,

IMPORTED AND INTRODUCED BY

MICHAEL E. FOSTER,

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Retail	1s. 6d.	Wholesale	12s. per doz.
"	2s. 6d.	"	20s. "
"	6s. 0d.	"	50s. "

N.B.—To Shippers and others requiring it in Bond, M. E. F. will be happy to forward Special Quotations.

DR. C. R. COFFIN'S AMERICAN DENTIFRICE.

Prepared only by WILLIAM DARLING, Chemist, Manchester.

May be had from S. MAW, SON & THOMPSON; BARCLAY & SONS;
NEWBERY & SONS; SANGER & SONS; and any Wholesale House in London.

Price 2s. per box, and family jars, 10s. each.

LINEHAM'S REGISTERED HAIR DRESSING BALSAM
is unequalled for removing Scurf and preventing Baldness, perfumed with Otto of Roses, invaluable for Headache or Hot Climates. Encased in bottles, 11s., and an enlarged size, containing nearly three small ones, 22s. per doz.

LINEHAM'S NEW BRITISH EXCELSIOR PREMATURE GREY HAIR REGENERATOR. A marvellous Restorer, will not injure the health or soil the dress. Unequalled for quality and price. In large bottles, 18s. per doz.

LINEHAM'S INSTANTANEOUS WHISKER OR HAIR DYE. Harmless and efficient. In cases, with instructions, 18s. per doz., easily applied.

May be obtained through any Wholesale House.

Diploma of Merit, Vienna Exhibition, 1873.



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FOULKES' CEMENT

AS USED IN ALL THE GOVERNMENT MUSEUMS.

Suited for any substance, from glass and china to leather, wood, or iron, and the articles joined bear washing in boiling water.

The large range of materials to which this cement is applicable, its transparency, strength, and facility in use, and the readiness with which it adheres, renders it without doubt, THE MOST USEFUL EVER INVENTED. It is equally applicable to articles of the coarsest or the most delicate construction.

The great success which attended its introduction, now more than 20 years ago, has given rise to a host of imitations, under as many various titles, some of these being of an exceedingly crude character, and most unsatisfactory to both vendor and buyer. The above celebrated Cement is uniformly prepared and neatly put up, and is guaranteed to remain unchanged in any climate.

Professor ARCHER, Edinburgh.—“I have invariably found yours superior to all others, and have extensively recommended its use to all my friends.”

Sold in Bottles at 6d. and 1s. (equal to 3 of the small).

FOULKES' TOILET & NURSERY POWDER.

IMPALPABLE AND DELICATELY PERFUMED.

This unique Powder possesses the emollient properties of fuller's earth, free from colour, and in a high condition of purity.

Sold in Boxes at 1s. and 6d.

Wholesale at the Patent Medicine Houses and Druggists' Sundriesmen; or from

W. J. FOULKES, Operative Chemist, Birkenhead.

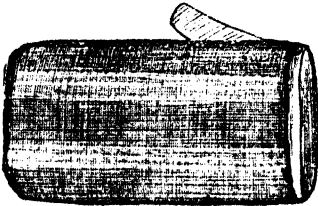
DINNEFORD & CO. (The Original Patentees)

Beg to announce that they have resumed the Manufacture, on their own premises and with Improved Machinery, of

Horse-Hair Friction Gloves, Belts, Bath Brushes, Oxford and Cambridge Pads, &c., &c.

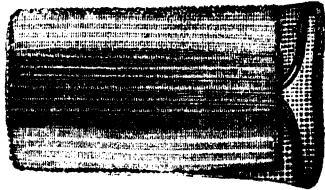
In white, grey, and black hair, of various degrees of hardness, to suit the most delicate, without risk of injury to the skin.

WHOLESALE PRICE LIST.



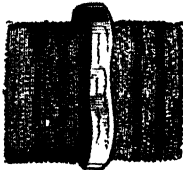
LADY'S AND GENT'S FLESH GLOVE (in Paris).

No. 1 size, 36s.; No. 2, 40s.; No. 3, 42s.
per doz. pairs. Retail, 5s.



PRINCE OF WALES BATH GLOVE.

For wet or dry use. 21s. per doz. Retail, 2s. 6d. each.



CLARENDON FLESH RUBBER.

Hair on both sides. One surface is soft, the other hard; either may be used for friction.
21s. per doz. Retail, 3s. 6d. each.



ARMY BATH PAD.

For wet or dry use. Hair on both sides.
A luxury for the Bath. 12s. per doz.
Retail, 2s. each.

OXFORD WASHING PAD.

For cleaning and softening the hands, and for the bath. In 1 doz. boxes; 8s. per doz.;
Retail, 1s. each.

ALEXANDRA BATH BRUSH.

Hair on both sides, on a long handle. 21s. per doz. Retail, 2s. 6d. each.



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Hair on both sides; for softening the hands and for the bath, 12s. per doz. Retail, 1s. 6d. each

THE DEMIDOFF.

12s. per doz. Retail, 5s. each.



FLESH STRAP OR BELT, AND BATH STRAP.

LADIES' quality, light hair and soft pile. GENTS' quality, black or grey, and pile of various degrees of hardness. 42s. per doz. Retail, 5s. each.

180, NEW BOND STREET, LONDON, W.

MANUFACTORY: FOLEY WORKS, OGLE STREET, MARYLEBONE.

Wholesale Agents: **MAW, SON & THOMPSON, 11 & 12, Aldersgate Street, E.C.**

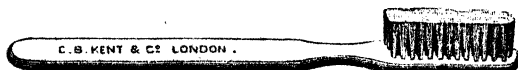
KENT'S BRUSHES

FOR OVER ONE HUNDRED YEARS HAVE BEEN CELEBRATED FOR
THEIR DURABILITY AND SOUNDNESS.

TOOTH BRUSHES.



Double Tooth and Sponge.



MR. PIERREPONT'S PATTERN.

G. B. KENT & SONS have Special Patent Machinery for the Manufacture of Tooth Brushes. The colour of the Bone and Bristle, also Workmanship, is unsurpassed.



NAIL BRUSHES IN BONE, WOOD, AND IVORY.

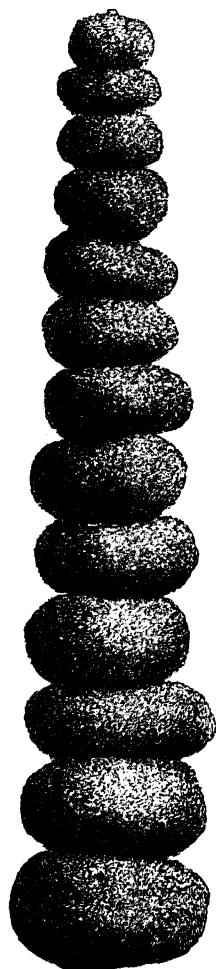


HAIR BRUSHES IN IVORY, WOOD, AND BONE.



COMBS IN INDIA-RUBBER, SHELL, IVORY.
IMPORTERS OF SPONGES FOR TOILET, BATH, AND STABLE PURPOSES. SPONGE BAGS AND CHEST PROTECTORS IN ALL SIZES AND MATERIALS.

WASHING GLOVES OF ALL KINDS, &c., &c.



SPONGES ON STRINGS

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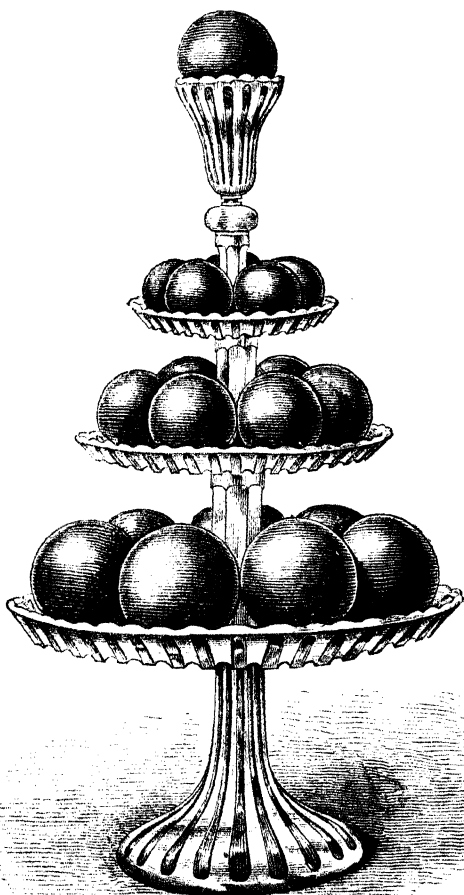
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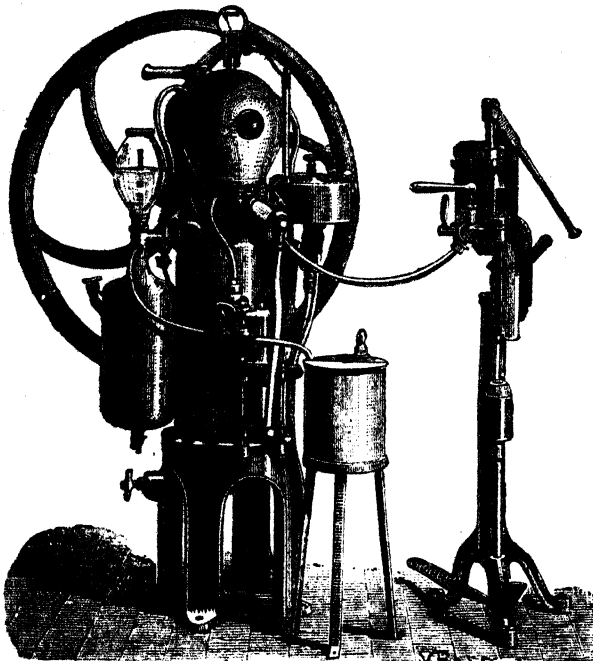
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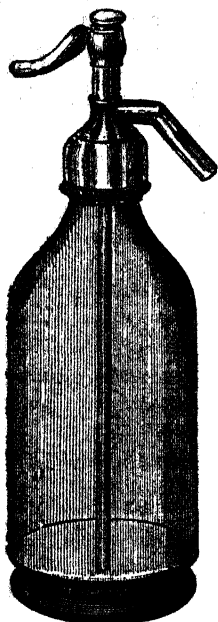
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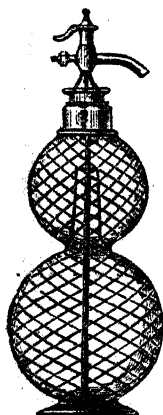
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